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THE RATIONAL USE OF TOURNIQUETS[1]

Special Contribution

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THE tourniquet is necessary in battle surgery and in elective surgery. Its use with refrigeration technique in surgery of the extremities has been developed recently. Experiments on its effect on the development or prevention of shock from wounds of the extremities widen its field of usefulness. The technical details of application of the tourniquet, however, are often irrational.

HISTORICAL DATA

Heliodorous (35), in the Second Century, A.D., said, "I have been accustomed to apply a bandage above the part to be amputated, so as to compress the vessels as far as possible . . ." Wilhelm Fabry (31) in 1593, using his own tourniquet, advised amputation of an extremity above the level of gangrene. In 1674, Morell (42) introduced the padded Spanish windlass (Fig. 1) which theretofore had been exclusively an instrument of strangulation. Half a century later, "Le Grand" Petit (46) invented the screw tourniquet to maintain more delicate control of the pressure (Fig. 2). As late as the Crimean War, the British were using a simple shortened leather belt [Fig. 3 (54)]. In 1896, von Esmarch (30) described his flat rubber bandage, which saved many lives on the battlefield and later was adapted to the purpose of preoperatively rendering an extremity bloodless. The introduction of round rubber tubing was followed by widespread use of this material alone or with the aid of mechanisms for holding it in place [Figs. 4, 5, and 6 (18, 45)]. Finally, in 1904, Harvey Cushing (21) described the application of Riva-Rocci's sphygmomanometer cuff for surgical hemostasis.

[1]The opinions or assertions contained herein are those of the writer. They are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.

APPLICATION IN WAR SURGERY

Confronted in the battlefield with active bleeding from an extremity, the surgeon must decide if the injured limb is worth preserving (36). If it is hopelessly damaged, he may apply a permanent tourniquet. A simple windlass is adequate. This may be applied readily without moving the extremity. It must be placed as near the wound as possible. The degree of tension required may be regulated by observing the point at which bleeding stops and then taking an extra turn so that subsequent restoration of the blood pressure will not force further hemorrhage. Actually, it may be made tighter, for in this use of the tourniquet local damage to the tissues is not of great importance.

A function of the permanent tourniquet other than hemostasis is that of diminishing shock after severe injuries of the extremities. Duncan and Blalock (25, 26) crushed the hind legs of dogs with 500 pounds of pressure for five hours. They treated some by the application of a constricting boot on the injured leg after removal from the press to prevent the accumulation of fluid in the damaged tissues. Eighteen of 19 animals died when treatment was withheld, while only 6 of 21 died when constriction was applied immediately after removal from the press. The possibility of absorption of toxic substances (the alternative theory maintained by Allen [8] and others) is likewise prohibited by the constriction. A similar and possibly effective use of the permanent tourniquet is to stop the ascent of infection caused by gas gangrene and its associated toxins (49).

If the surgeon decides that the extremity is to be preserved, he must consider certain facts before applying a temporary tourniquet and the most important is that a tourniquet of any form may not be necessary. Elevation of the extremity, local

Fig. 1. The garotte; Morell (1674); Spanish windlass first used in siege of Besançon.

pressure with a sterile dressing over the bleeding area, or pressure along the course of the spurting artery may secure hemostasis.

As was noted before, there are many types of temporary tourniquets. A form which permits adjustment of the constriction just beyond the cessation of the blood flow is desirable. The proper tension is very difficult to obtain with the Esmarch bandage or the tubing tourniquet applied in successive turns, either excessive or inadequate pressures being the rule. Ball and Quist (12), commenting on air-raid casualties in London, state that although most of the patients with injuries of the limbs had tourniquets applied before admission to the casualty station, in most cases they had been applied ineffectively and had allowed a slow, steady ooze of blood. These authors believed that a firm sterile dressing applied directly over the wound would be of more value for routine use. A trial at adjusting the rubber tourniquet at reasonable levels above the systolic blood pressure will show that variations of 150 mm. or more are frequent. Authors agree that the placing of an arterial tourniquet at the effective tension is a matter of practice. Also it must be re-

Fig. 3. The shortened leather belt used by the British Army up to the Crimean War.

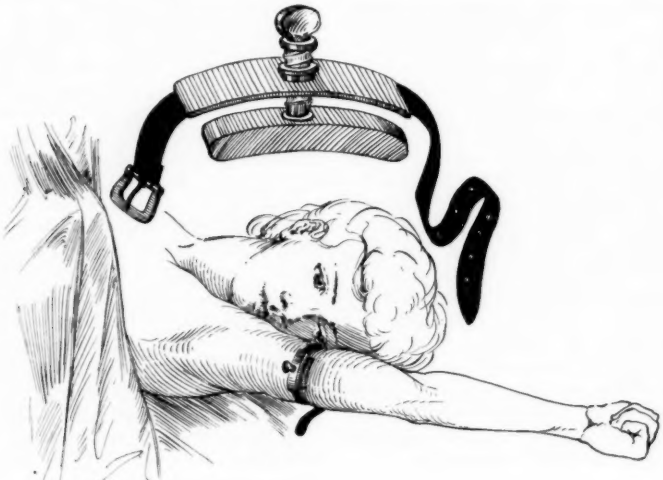

Fig. 2. The screw; Petit's tourniquet, 1718.

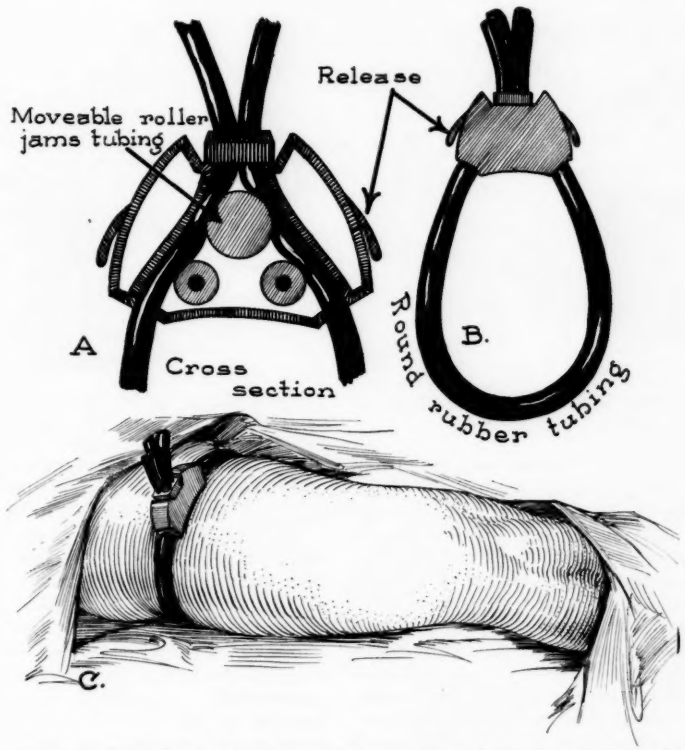

Fig. 4. Rubber tubing with roller mechanism. a, Shows in cross section how roller jams tubing, released by the bilateral handles. b, Tourniquet in complete form. c, In place on arm.

membered that each superimposed turn of the Esmarch tourniquet has an additive effect. This is easily shown by placing a blood pressure cuff about the arm, adjusting the tension to 90 mm. Hg, and then applying turn after turn of the Esmarch bandage over it. The first and each successive turn raises the constrictive pressure by 30 mm. or more, according to the pull maintained on the free end.

The temporary tourniquet, in contrast to the permanent one, should be placed as far from the wound as is convenient (with avoidance of certain vulnerable areas) because it is often more difficult to apply and because its periodic release will disturb the wound. If possible, the extremity should be elevated before each application to retain the blood contained distal to the tourniquet. Although no experimental evidence is available to determine the frequency with which the tourniquet should be released, it is generally supposed to be at half-hour intervals. The tourniquet should be moved slightly each time to minimize the local damage. This interval also allows opportunity to note whether hemostasis has occurred, which will make the tourniquet no longer necessary. Periodic release also diminishes the severity of the shock which, as we shall point out, follows release after prolonged constriction. The lowering of resistance of the tissues of the injured limb is also counteracted to a certain degree by this periodic flushing and reoxygenation of the extremity.

All persons with tourniquets in place must be regarded as surgical emergencies and be given hemostatic operative treatment at the earliest opportunity. Good field technique includes the administration of morphine for the pain from the arterial tourniquet, and the use of care to prevent movement of the limb or slipping of the tourniquet which would result either in further hemorrhage or in damage to the local tissues.

A last point concerns the desirability of refrigerating the extremity distal to the tourniquet.

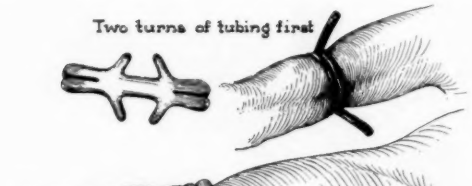

Fig. 5. Rubber tubing with catch mechanism; Milroy Paul's type of tourniquet.

Fig. 6. Rubber tubing with pull and catch mechanism; Samway-Callander tourniquet, 1940 (1892).

Brooks and Duncan (16) showed that the rate of development of gangrene after constriction of the rat's tail varied directly with the temperature (Table I). At freezing temperatures, almost no gangrene developed; at 40° C., from three to four hours of compression were sufficient to kill the tissues of the rat's tail. Hence, the extremity to which a tourniquet has been applied should be kept cool to lower the metabolic processes in the presence of ischemia. Blalock (13, 14, 24) was able to inhibit the development of shock by cooling the crushed extremity (Table II). Five of 10 dogs were kept alive after crushing injuries by packing of the injured part in ice immediately after trauma (at the time the tourniquet was applied). Ten dogs had the tourniquet applied for five hours after injury and were given from 5 to 10 per cent of their body weight in intravenous plasma. None lived after removal of the tourniquet and the average survival time was fourteen hours. To this group is compared those which received the same treatment but in addition had ice packed about the traumatized limb. Half of these dogs lived and half survived for an average of seventeen hours. The regional loss of plasma, which Blalock believed to be the principal factor in this form of shock, averaged 7.8 per cent of the body weight in the untreated animals and 5.4 per cent in those treated by refrigeration.

Refrigeration is also used after injuries to large vessels of the extremities. Reducing the temperature, and hence the rate of metabolism, lowers the oxygen requirement until either the vessel is repaired or collateral channels are established. Parenthetically, the same scheme can be followed in cases of arterial occlusion. In cases of diabetic gangrene the tourniquet is used (with or without cooling) to stop absorption and allow improvement of the condition of the patient (1, 2, 3, 9, 40).

TABLE I—THE DURATION OF ISCHEMIA RESULTING IN GANGRENE AT VARIOUS TEMPERATURES

(From Brooks and Duncan, 1940)

T.°C.	Hours
1	>96
5	96
15	48
30	14
35	8 to 10
40	3 to 4

APPLICATION IN CIVILIAN PRACTICE

In civilian practice, there are several uses for the tourniquet other than the familiar operative one. In acute cardiac decompensation, the use of venous tourniquets was well established by Ebert and Stead (27), who showed that the amount of fluid shift was equivalent to the amount usually removed by venesection. Reactions to subcutane-

TABLE II. — DIMINUTION OF SHOCK BY COLD IN LOCAL ANEMIA

(Blalock, 1943)

Procedure	No. of dogs	Tourniquet, hours	Plasma, per cent	No. of survivors	Average survival in hours	Fluid loss per cent
Trauma, tourniquet, and plasma	10	5	5–10	0	14	7.8
Trauma, tourniquet, plasma, and cold	10	5	5	5	17	5.4
Trauma, tourniquet, and cold	10	5	0	4	23	5.4

ous serum may be slowed up by the application of a tourniquet proximal to the site of injection. The tourniquet may be used similarly for excess of hypodermic drugs or after snakebite.

The use of the tourniquet during surgical operations is well known. The maneuvers, however, are often performed incorrectly and irrationally. Three factors affect the rational application of the tourniquet in surgical procedures: (1) the effect of the position of the cuff, (2) the effect of the duration of application of the cuff, and (3) the effect upon the local tissues by the cuff.

Position of the tourniquet. There are two vulnerable areas over the course of the radial nerve, an unsafe area along the sciatic nerve and the exposed length of the common peroneal nerve. With the more crude field tourniquets discussed earlier, all shaded areas in Figure 7 should be avoided; with the pneumatic tourniquet, the black areas about the elbow and knee should be excluded, but the upper arm and thigh are suitable. The forearm and lower leg are safe places to apply a tourniquet.

Duration of the application. The length of time that a tourniquet may be left in place during an operation generally has been set at "about half an hour or a little more," although some surgeons maintain that up to fifteen hours is safe (52). Four hours appears to be a safe period of application. The five factors limiting this period are: gangrene, injury to the nerve, trauma to the skin, decrease in tissue resistance by anoxia, and shock on removal of the tourniquet.

Wilson and Roome (56) showed that there was no evidence of gangrene in the legs of dogs after twenty hours of constriction. Frederick Allen (7) noted recovery in the rat after thirteen hours, and in the dog after fifteen hours. There are no figures available for man, but these workers believe that they are of the same order of magnitude. Auchincloss (11) has kept a tourniquet in place for four and a half hours without injury. It is common practice at the Cincinnati General Hospital to maintain constriction for four hours.

Injury to the nerve is the second possible deleterious effect of prolonged constriction (4, 15). The evidence indicates that the nerve is injured by direct pressure at the site of constriction, and not by peripheral ischemia. Eckhoff's series (28) and Table III show the results over a period of years at several English hospitals. The preponderance of injuries to the radial nerve should be noted. Paralysis from tourniquet injury rarely is permanent. Sensation always is recovered early and motion returns after two or three months. The evidence that nerves can withstand relatively long

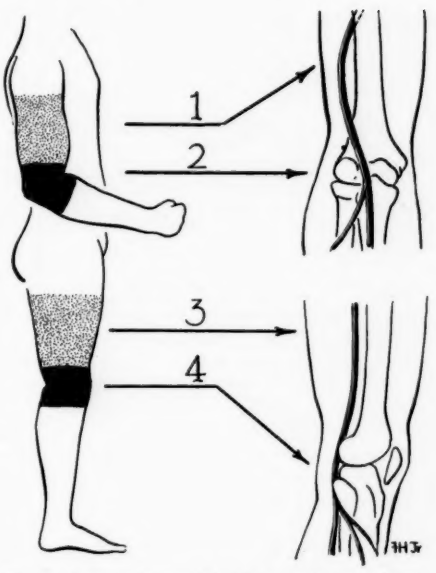

Fig. 7. Areas to be avoided in use of the tourniquet.

periods of anoxia is reinforced by the work of Cannon and Burket (20), who occluded the circulation to a loop of small bowel by ligatures and by compression between glass plates. They determined that the myenteric plexus survived after three hours or more of anemia, since peristalsis was normal on release. Table IV, from their data, shows the structures of the central nervous system in the order of their resistance to anoxia. The more resistant peripheral nerves are placed last.

Damage to the skin is the third possible effect of prolonged constriction. A single very prolonged application of a narrow tourniquet caused necrosis of the skin of animals (7) when the intervals of application were longer than the duration of most surgical operations. Pinching of the skin does occur, however, between the coils of the tubing tourniquet or the unevenly applied pneumatic tourniquet. The lesion is bullous and heals like a second-degree burn, as we have seen in one case.

The fourth consideration is the devitalizing effect of the ischemia upon tissue distal to the point of constriction. Allen (7) noted that infection spread at a more rapid rate in the ischemic legs of dogs than in those without constriction. Even after refrigeration of the ischemic extremity, release and warming allow rapid advance of the infection. Hence in operation on infected extremities, care must be taken to release the tourniquet frequently and to shorten the procedure if possible.

TABLE III. — TOURNIQUET INJURY OF THE NERVES

(From Eckhoff, 1931)

Age, sex	Operation	Paralysis	Recovery	Anesthesia	Recovery
M 18	Sut. Flex. Dig. I	Uln. Med.	3 mo.	None	
F 34	Sut. Flex. Dig. V	Uln. Med.	3 mo.	Numb hand	2½ mo.
F 25	Sut. Flex. Carpirad.	Rad.	3 mo.	None	
M 17	Exc. Radial Head	Uln. Med. Rad.	5 mo.	Tingling, hand	1 day
F 47	Wiring, Humerus	Rad.	6 mo.	Doubtful	
M 24	Plating, Radius	Rad.	3 mo.	Numb hand	3 day
M 16	Exc. Fragm. Humerus	Uln. Rad. Med.	1 mo.	Total forearm	3 wk.
M ?	Exc. Cyst, Wrist	Uln. Med. Rad.	2 mo.	Total forearm	3 day
F 32	Transplant, Uln. n.	Uln. Med. Rad.	2 mo.	Total forearm	3 day
M 37	Sut. Brachiorad. Tend.	Uln. Med. Rad.	4½ mo.	None	
M 26	Sut. Flex. Dig. V	Uln. Med. Rad.	2½ mo.	Total forearm	3 wk.
M 20	Plating, Radius	Rad.	3 mo.	Total forearm	2 mo.
M 14	Plating, Radius	Rad.	3 mo.	Hand	3 day
M 24	Op. Reduct, Elbow	Uln. Med. Rad.	5 mo.	Total forearm	2 mo.

The interval between deflations will vary with each case, but a half-hour interval is safe. This is also true in plastic surgery in which the viability of skin flaps is questionable. The safe period is said to be prolonged by packing ice bags beneath the limb and irrigating with cold saline solution.

The length of time the cuff must remain deflated to allow reoxygenation of the tissues has not been determined, nor do estimates appear in the literature. Three minutes is a reasonable time. Shorter periods would not allow adequate exchange between the intercellular fluid and the blood. A longer wait would prolong the operation unreasonably.

Elevation of the extremity before inflation of the cuff is customary. As a result the venous ooze during the operation is decreased and a certain amount of useful blood is restored to the circulation. Prolonged elevation brings about a physiological compensation with vasodilation which cancels some of the gain. Too brief a period of elevation does not allow maximum fall of the venous pressure. Three minutes is generally accepted as a reasonable period.

TABLE IV. — NERVOUS TISSUE SURVIVAL WITH ISCHEMIA

Small cortical pyramidal cells	8 min.	Gomez and Pike (34)
Brain: limit of resuscitation	15 min.	Mayer (41)
Medulla	30 min.	Gomez and Pike (34)
Spinal ganglia	30 min.	Gomez and Pike (34)
Spinal cord	1 hour	Ehrlich and Brieger (29)
Sympathetic ganglia	1 hour	Tuckett (55)
Myenteric plexus	3 hours	Cannon and Burket (20)

Following this period of elevation, the cuff should be inflated rapidly to the proper pressure. Hesitation results in venous stasis and engorgement of the distal blood vessels. Inflation is often the duty of the anesthetist, who is not aware of the necessity for decisive action. He need only allow the pressure to stay for a moment below systolic blood pressure to distend the blood vessels. The use of the long flat Esmarch bandage in spiral fashion to express the blood from the extremity before application of the tourniquet is helpful, but usually elevation alone is enough.

The fifth and last factor which limits the duration of the use of the tourniquet is the effect upon release of the tourniquet. The restoration of the circulation is accompanied by a fall in the blood pressure (19), the degree of fall depending on the duration of the constriction, the condition of the patient, and the amount of tissue rendered ischemic. Chart I, from Wilson and Roome (56), shows the customary effect. In this case, release of a tourniquet from the thigh of a patient after two and one-quarter hours of constriction resulted in a sudden drop of 35 mm. Hg in blood pressure. This drop must be avoided if the patient is in a precarious condition. The pressure rises again, then slowly falls to slightly below normal. Table V, also from Wilson and Roome (56), shows in dogs the relation between the duration of the constriction and the incidence of death after release. With less than three hours of constriction, none died, whereas with more than six and one-half hours of constriction, all died. Table VI shows the effect of various forms of treatment on the shock produced upon release of the tourniquet. Without amputation, all dogs die. If the treatment consists of amputation and blood transfusion, the animals recover. Blood alone does not save them. Blalock (13, 37) has shown that an average of 2.4 per cent of the total body weight removed as plasma at six-hour intervals results in the death of the dog in an average of twenty-eight and one-half hours. Mylon *et al.* (43) obtained similar results on release of tourniquets from the hind legs

TABLE V. — EFFECT OF DURATION OF CONSTRICTION

(From Wilson and Roome, 1936)

Number of dogs	Duration of constriction	Result
2	<3 hours	0 died
12	3 to 6½ hours	⅗ died
5	>6½ hours	All died

of dogs. The rather direct relationship between the amount of fluid lost into the constricted or traumatized leg and the development of shock suggests that the phenomena following release of a tourniquet after a long period of constriction are due in the main to loss of fluid from the general circulation into the extremity because of the increase in permeability of the capillaries due to the ischemia (53). The application to operative surgery is obvious: the period of ischemia must be limited and the ischemic area must be kept as small as possible. When the cuff is removed, the patient should be watched carefully for a precipitous fall in blood pressure and be observed for a later gradual decline in this pressure. Patients who are in or near shock should have tourniquets applied for short times only, with frequent deflation of the cuff. As Davis (22) stated, ..."We have had an occasional drop in blood pressure upon release of the constriction and are familiar with other instances in which the patient developed profound shock immediately after this procedure."

The danger of shock and of damage to the tissues, rather than injury to the nerve and skin, or gangrene, is the limiting factor to extended applications of the tourniquet. Four hours is a safe period to maintain constriction in the operating room, and should cause no damage.

Effect upon the local tissues by the cuff. Local compression of the tissues is effected by two factors: the width of the cuff, and the pressure of the cuff. The desirable width of the tourniquet has not been established. Allen (7) advocates a narrow tourniquet but does not take local damage to the skin sufficiently into account. A wide tourniquet, on the other hand, distributes the compression over the unequally yielding tissues and does not cut into the skin. Ragan and Bordley (47) have shown that a narrow sphygmomanometer cuff gives blood pressure readings which are too high. It follows then that it takes a higher pressure with a narrow cuff to stop arterial blood flow than with a wide cuff, and so the narrow cuff leads to greater damage of the tissues. This is supported by the work of von Recklinghausen (48) and of Norris and his coworkers (44).

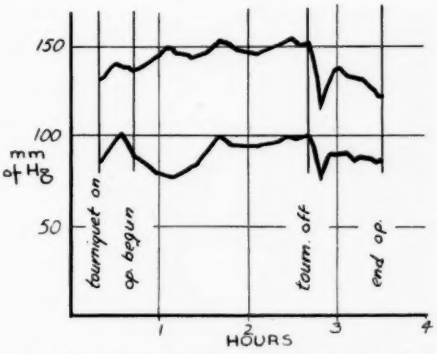

Chart I. Effect of tourniquet about thigh on the blood pressure. (From Wilson and Roome, 1936.)

The factors governing the pressure to which a pneumatic tourniquet should be inflated are often misunderstood, yet are obvious in principle. An arterial tourniquet is used to stop arterial blood flow. The level of from 240 to 260 mm. Hg, most often used, was chosen to be above the systolic blood pressure of all but the most severe hypertensive patients. Blood may escape under a cuff set at 240 mm., but such pressure is not needed in most cases. Lahz (38), who alone discusses this question, believes that from 10 to 20 mm. above the preoperative systolic blood pressure is enough. A different conclusion is reached from a study of the blood-pressure records of 137 consecutive operations at the Cincinnati General Hospital, 100 of which were performed with general, and 37 with local anesthesia (Chart II). The preoperative systolic blood pressure is charted against the rise during operation above the preoperative level.

TABLE VI.—SURVIVAL AFTER RELEASE

(From Wilson and Roome, 1936)

Duration of Constriction (hours)	Treatment	Survival (hours)	Weight loss (per cent)
10	Blood and intravenous saline solution	16	7.3
7	Blood and intravenous saline solution	7	4.0
7	Plasma	30	6.0
7	Plasma and saline solution	12	6.5
10	Amputation 1½ hours after release; blood	Recovered	
7½	Amputation 4 hours after release; blood	Recovered	
8	Amputation 3½ hours after release; no blood	8	
7¾	Amputation 3¾ hours after release; no blood	32	

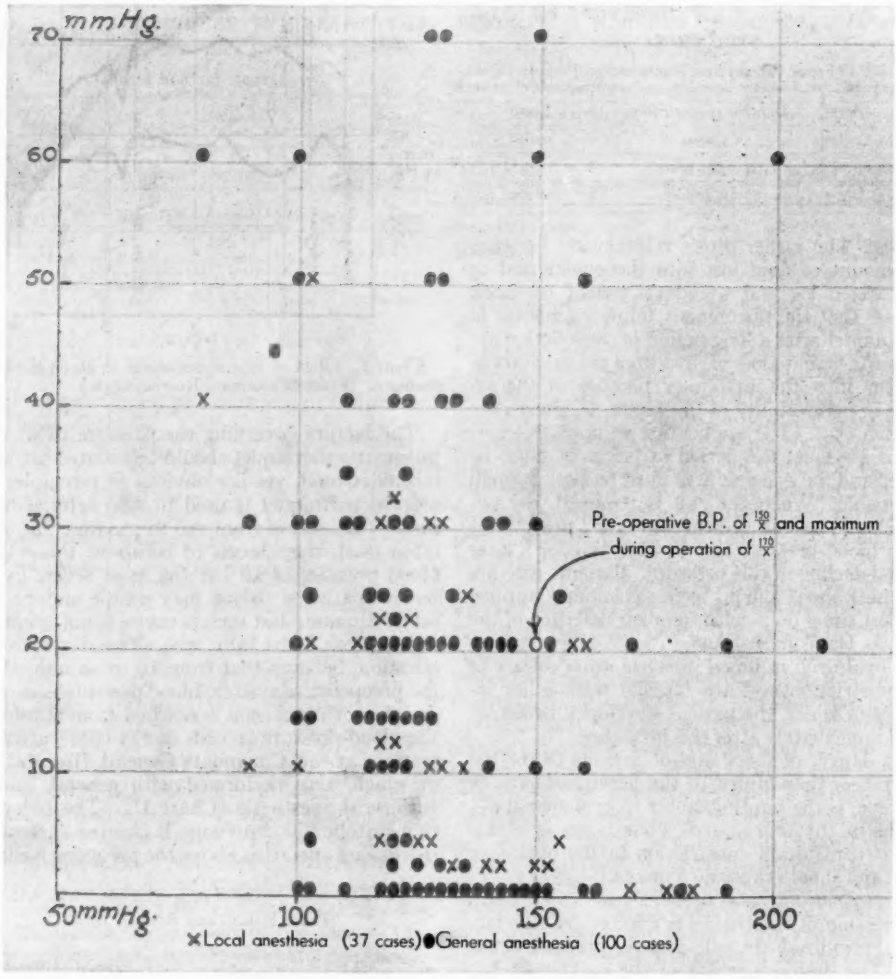

Chart II. Operative hyperpiesia; consecutive cases at the Cincinnati General Hospital in December, 1942. The column of figures at the left shows the maximum minus the preoperative blood pressure; the figures across the bottom show the preoperative blood pressure (systolic).

It is seen that the peak is approximately 40 mm. above the preoperative level. A few cases lie in the 50 and 60 mm. range. Three patients had increases as high as 70 mm., because (as noted on the anesthetic records) of respiratory difficulty either during induction or during change of the anesthetic technique. The highest differential recording for local anesthesia was 50 mm.

This study shows that there would have been no leakage under the blood-pressure cuff tourniquet set at the preoperative level of the systolic blood pressure plus 70 mm. This varying but readily determinable level should be used routinely. The arbitrary levels of 240 and 260 mm. may be avoided; they serve only to increase local tissue damage.

To summarize the suggested technique (Fig. 8): (1) Elevate the extremity for about three minutes and (2) apply the pneumatic cuff smoothly above or below the knee or elbow, and cover it with

gauze bandage to prevent slipping and ballooning. (3) Roll Esmarch up. (4) Roll rest of Esmarch tightly below the tourniquet cuff. (5) Inflate the cuff rapidly, placing the level at 70 mm. plus the systolic blood pressure. (6) Clamp the inlet tubing to prevent leakage, (7) remove Esmarch and (8) drape with the rolled-towel technique so that the extremity may be readily elevated during the procedure should that become necessary. In addition, keep the arm or leg cool by using unheated saline solution for irrigation and by avoiding unnecessary spotlights. This tourniquet may be left in place as long as four hours if properly placed. It should be released every half hour if infection is present, if the vitality of the tissues is in doubt, or if the condition of the patient is poor. Watch for a precipitous fall in blood pressure when the tourniquet is released after long periods of application.

Fig. 8. Application of tourniquet: (1) Elevate the extremity for about three minutes and (2) apply the pneumatic cuff smoothly above or below the knee or elbow and cover it with gauze bandage to prevent slipping and ballooning. (3) Roll Esmarch up. (4) Roll rest of Esmarch tightly below the tourniquet cuff. (5) Inflate the cuff rapidly, placing the level at 70 mm. plus the systolic blood pressure. (6) Clamp the inlet tubing to prevent leakage. (7) Remove Esmarch. (8) Drape with the rolled-towel technique so that the extremity may be readily elevated during the procedure should that become necessary.

SUMMARY

1. The indications for use of the tourniquet and the reasons behind the use of its various forms in war surgery and in elective surgery are reviewed.

2. The permanent and temporary tourniquets in war surgery are contrasted, and the indications for the type of tourniquet, the site of application, the pressure required, the relation to shock, and the use of tourniquets with refrigeration are described.

3. Application of the tourniquet in civilian life in surgical operations is limited by the effect of the position of the cuff, the effect of the duration of the application of the cuff, and the effect on the tissues by the cuff.

4. The duration of application is in turn limited by the incidence of gangrene, nerve injury, injury to the skin, diminished tissue resistance by anoxia, and shock upon removal of the tourniquet. The last two are the greatest dangers. Four hours is recommended as the maximum period for application.

5. The argument is given for setting the pneumatic tourniquet at 70 mm. Hg plus systolic blood pressure.

6. The suggested technique for the use of the pneumatic tourniquet is reviewed step by step.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Woodhall, B., and Spurling, R. G.: Tantalum Cranioplasty for War Wounds of the Skull. *Ann. Surg.*, 1945, 121: 649.

As a result of the large number of cranial injuries sustained in the present war, interest in treating the often concomitant cranial defects has been renewed. Several new methods of cranioplasty which have appeared in the past few years include the use of plastics, vitallium, and tantalum. Of these, tantalum has become the most popular because of its inertness and the ease with which it may be handled. Although methylmethacrylate and vitallium may be equally inert, the former has received only a limited application, and the latter is more difficult to use as it must be cast.

At Walter Reed General Hospital, Washington, D. C., 79 patients had tantalum cranioplasties in a period of eleven months, and one-half of them were returned to duty. In the Army, the indications for cranioplasty are similar to those in civil practice except for one item— the Army regulation states that an individual with a cranial defect of more than 3 cm. in diameter may not be returned to duty. In civil practice such small defects would oftentimes be considered of little consequence.

In the present report an impression of the defect is made of softened dental compound. From this, a model is formed with dental stone or plaster, and the desired contour is formed with wax. A mold of the area is made with any of the molding sands and a dye and counter dye is poured with zinc or hydromite. The plate is swedged into shape by pressure, kinks and furrows being eliminated by hammering. The polished plate with a single hole is then cleansed and sterilized in an autoclave.

The operation was usually carried out under local anesthesia and after premedication with nembutal, morphine, and atropine. Indicated cortical resections and dural repairs were carried out and then a ledge was formed in the bone edge. The plate was then trimmed with heavy scissors to fit into the ledge, and fixation was secured with triangular points of tantalum. Penicillin was used parenterally and locally. No postoperative infections were encountered after the institution of this regime.

The two-stage method of obtaining a direct impression of the defect at the initial operation would be more applicable in civilian neurosurgery. In such cases the need of future cranioplasty would be realized, and the bone edges prepared. Since an exact impression would be available, the second operation could be carried out expeditiously. An excellent suggestion is the insertion of tantalum foil at the first operation to prevent adhesions between the scalp flap and the underlying tissues.

An electroencephalographic study of the possible effect of cranioplasty upon a convulsive state was carried out on 26 cases. These were selected cases controlled by conservative treatment. Twelve cases showed no change in the electroencephalographic pattern, 10 showed an improvement in a previously abnormal record, and 4 revealed an increased abnormal record with the development of epileptogenic foci.

JACK I. WOOLF, M.D.

Pugh, D. G.: Fibrous Dysplasia of the Skull; A Probable Explanation for Leontiasis Ossea. *Radiology*, 1945, 44: 548.

Lesions of the skull associated with polyostotic fibrous dysplasia (Fig. 1) have a characteristic roentgenological appearance. Fibrous dysplasia of the bones of the skull occurs at times without obvious involvement of the remainder of the skeleton. If fibrous dysplasia of the bones of the skull is found, roentgenological examination of the entire skeleton should be carried out. In most cases it seems prob-

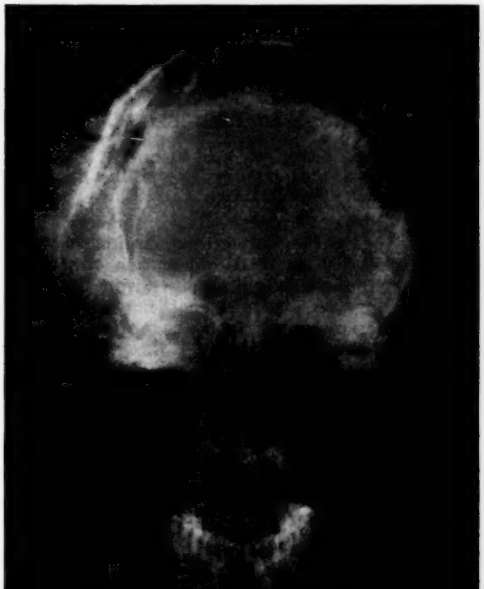

Fig. 1. Polyostotic fibrous dysplasia. This patient had typical fibrous dysplasia of much of the skeleton.

able that leontiasis ossea is a manifestation of fibrous dysplasia of the bones of the skull.

EYE

Lutman, F. C., and Neel, J. V.: Inherited Cataract in the B. Genealogy; Occurrence of Diverse Types of Cataract in the Descendants of One Person. *Arch. Ophth.*, Chic., 1945, 33: 341.

The authors discuss the occurrence of diverse types of inherited cataract in the descendants of one person in the B. genealogy.

This genealogy, which extended over 5 generations and comprised 123 people, presented 44 cataracts from childhood onward. Of the 34 patients examined, 21 had cataract.

The cataracts were of three distinct types: (1) fenestrated opaque flakes chiefly in the axial region of the anterior adult nucleus; (2) an opacity in the fetal nucleus containing flakes or spherical bodies, and (3) opaque lens fibers, especially adjacent to the adult lens sutures (encountered in only 1 case).

The first type occurred to the exclusion of other types in one line of the family and the second type predominated in another branch. Three hypotheses are advanced for the occurrence of these distinct types of cataract, the most acceptable of which is the first.

1. The presence of genetic and environmental modifiers which produce variations in the expression of the "main" factor.
2. The presence of 2 different, independently inherited factors in the founder of the line.
3. The occurrence of mutation.

JOSHUA ZUCKERMAN, M.D.

NOSE AND SINUSES

Hagens, E. W., Karp, M., and Farmer, C. J.: The Inhalation Method for Penicillin Therapy; Preliminary Report. *Arch. Path.*, Chic., 1945, 41: 333.

Twenty-two patients were treated with penicillin by the inhalation method. The urine and blood levels show that the drug is absorbed from the lungs to a sufficient degree to offer another method when penicillin therapy is indicated. The inhalation method probably has an additional advantage over other methods of administering penicillin because of its local effect. The inhalation of penicillin results in temporary improvement in bronchiectasis, but the condition frequently lapses back shortly after therapy is discontinued. In most cases gram-negative bacteria are encountered, so that another antibiotic substance is also necessary, one to which these bacteria are sensitive.

Asthmatic patients who have a superimposed bronchial infection with an organism to which they possibly are allergic may be favorably influenced by treatment. Acute pulmonary conditions respond to the inhalation treatment, and the method may be used advantageously in children and in other patients in which the usual methods of treatment, such as the intravenous or the intramuscular injection of penicillin, are unsuitable.

NOAH D. FABRICANT, M.D.

MOUTH

Schwartz, B. M.: Penicillin in Vincent's Angina. *J. Am. M. Ass.*, 1945, 128: 704.

Penicillin was found to be of definite value in the treatment of Vincent's angina in 14 cases. The recommended dose was 100,000 units administered intramuscularly in 20,000 unit doses every three hours. In mild cases smaller doses, and in unusually severe cases larger doses, may be required.

CHARLES BARON, M.D.

NECK

Vorhaus, M. G., and Rothendler, H. H.: Thiouracil in Hyperthyroidism. *N. York State J. M.*, 1945, 45: 1087.

In the past year the authors have observed the effect of thiouracil in 25 cases of hyperthyroidism. In 3 of the patients the drug was discontinued because of undesirable reactions; neuritic, febrile, anemic, and leucopenic complications were noted. In the remaining 22 cases beneficial modifications of the clinical state, ranging from slight to marked, were observed. In 5 patients the response to thiouracil therapy alone was deemed clinically insufficient to justify long-term administration. Operation was advised for these 5 patients, 4 of whom have already successfully undergone thyroidectomy.

In the remaining 17 cases there has been moderate to marked improvement in the hyperthyroid state. Five patients have remained asymptomatic for from two to four months after discontinuance of the drug. In 1 patient thiouracil was administered during the last six months of pregnancy without any apparent ill effect on the offspring. Four patients with diabetes and hyperthyroidism showed favorable modification of their diabetes as their hyperthyroid state responded to thiouracil. Three patients with auricular fibrillation returned to normal sinus rhythm following thiouracil medication.

The administration of thiouracil carries with it an unpredictable danger of unfavorable or toxic reactions. Deaths have been reported following the use of thiouracil or related drugs.

The drug for the optimal medical management of hyperthyroidism would seem to be a chemical compound retaining all the beneficial effects of thiouracil noted, but free of the undesirable and dangerous reactions.

EARL O. LATIMER, M.D.

Kennie, A. T.: The Treatment of Toxic Goiter with Thiouracil. *Glasgow M. J.*, 1945, 143: 141.

Thiouracil combines with free iodine in the thyroid gland. Thus, all available free iodine in the thyroid may be utilized by thiouracil and none left for the normal combination with tyrosin to form

diiodotyrosine, an essential step in the formation of thyroid hormone. The author believes that this conception helps to explain the poor and much delayed response so often encountered when thiouracil is given too soon after iodine therapy.

The author treated 42 toxic goiter patients with thiouracil. The period of treatment ranged from six months to more than a year. Three patients developed a slight conjunctivitis and 5 had a dry erythematous rash. There were no other toxic reactions encountered. Three patients failed to make a good response to the treatment. There was no improvement in exophthalmos when this condition was present, and the goiter could be expected to increase in size.

While the majority of the patients were being kept on a maintenance dose of from 0.2 to 0.1 gm. of thiouracil daily, 16 remained well from one to seven months after cessation of all treatment.

EARL O. LATIMER, M.D.

Reveno, W. S.: Thiouracil in Thyrotoxicosis. *J. Am. M. Ass.*, 1945, 128: 419.

Since 1943 when Astwood reported the action of the thyroid inhibitors, thiourea and thiouracil, numerous confirmatory observations appeared in the literature. Thiouracil has been the drug of choice as few instances of resistance to it have been recorded. Of these the most alarming presented agranulocytosis. With continuing investigations revealing clinical experience is gradually being reported.

In the present report the author sets forth his observations on the use of thiouracil in the management of thyrotoxicosis. He reports his observations made in the treatment of 32 patients who were divided into two groups: (1) those with toxic diffuse goiter and (2) those with toxic nodular goiter. The group with toxic diffuse goiter was represented by 15 patients, 11 females and 4 males, ranging in age from sixteen to sixty-six years. The group with toxic nodular goiter consisted of 17 patients, 12 females and 5 males, ranging in age from thirty-nine to eighty-two years. Symptoms had been present from two months to fifteen years in the first group and from two weeks to twenty years in the second. Twenty of the total number of patients had iodine up to the beginning of treatment with thiouracil, and 2 of these (both with toxic diffuse goiter) had x-ray therapy in addition. Five had had surgery for toxic diffuse goiter, 1 of these having had 2 thyroidectomies. The average initial basal metabolism was plus 32 in those with toxic diffuse goiters, and plus 22 in the adenomatous type. All were ambulatory from the beginning of treatment except 3 hospitalized patients who soon joined the ambulatory group.

An initial dosage of 0.6 gm. of thiouracil, given daily in three doses of 0.2 gm. each, appears adequate for all ordinary purposes. As soon as clinical improvement appears and the basal metabolic rate falls, a reduction in dosage to 0.2 gm. twice daily (twelve hours apart) may be made. With the stabilization of the metabolic rate between plus 5 and minus 10, a maintenance dose of between 0.1 and 0.3 gm. is sufficient to keep the patient's condition in remission. Observations, including blood studies, were made every two weeks until stabilization occurred and every four weeks thereafter.

Clinical improvement was noticeable earlier in the group with toxic diffuse goiters than in the adenomatous type. The average time in the former was an average of three weeks, whereas in the latter it was approximately nine weeks. Previous iodization delayed improvement in both groups, with a more prolonged delay in the patients with toxic adenomas.

Of special interest was the rise in the basal metabolic rate appearing shortly after the beginning of thiouracil therapy in previously iodized patients. It was due to the loss of the iodine effect. A subsequent drop in the basal metabolic rate proved the initial rise to have been due to the release from iodine influence coupled with a delay in the appearance of the thiouracil effect. Unless this is kept in mind, the drug may be discredited and its benefits denied some patients.

Of the 32 patients treated, 29 responded favorably 2 were not treated long enough and 1 patient was resistant to the drug. Of 5 cases in which an attempt was made to discontinue treatment, only 1 remained in remission for 5 months, 3 relapsed and were put under control with small doses of thiouracil, while 1 showed evidence of relapse. From this small experience it is difficult to predict when and in which cases to stop the drug. It appears desirable to determine the individual minimal maintenance dose and to continue with this for an indeterminate period. The average maintenance dose ranges from 0.1 to 0.4 gm. daily.

It was noted that under the influence of thiouracil treatment goiters tended to increase in size and become softer during the first few weeks. Thereafter decrease in size became more pronounced and occurred more rapidly in the toxic diffuse goiters than in the toxic adenomas.

In this series 1 instance of drug sensitization was encountered. Five patients developed minor disturbances such as nausea, vomiting, and epigastric cramping early in the treatment. This promptly disappeared after the discontinuance of thiouracil for a few days and its resumption at a lower dosage level. Six iodine-resistant patients were observed. They were brought under control with thiouracil. Five patients with recurrent hyperthyroidism following thyroidectomy were included in the group studied. These patients showed considerable sensitivity to thiouracil but responded promptly. Thiouracil may prove very beneficial both therapeutically and diagnostically in the mild forms of hyperthyroidism or in the borderline cases. It would appear preferable to adopt as the standard normal in these cases a basal metabolic rate of from plus 5 to minus 20.

One patient in the series developed myxedema in the course of treatment. Frequent observation and

controlled treatment with thiouracil cleared up the condition.

Fibrillation and cardiac decompensation in the thyrocardiacs were noted in 2 patients. Compensation with normal sinus rhythm was restored after six weeks and eight weeks, respectively, of thiouracil therapy.

There was 1 unexplained instance of resistance to thiouracil.

The data presented in this report demonstrate clearly in favor of thiouracil as the agent of choice in inducing and maintaining a state of remission in patients with thyrotoxicosis.

MATHIAS J. SEIFERT, M.D.

Erich, J. B.: The Treatment of Extensive Cicatricial Stenosis of the Larynx or the Trachea. *Arch. Path.*, Chic., 1945, 41: 343.

Extensive cicatricial stenosis of the larynx or of the upper part of the trachea usually can be treated most successfully by an open operation through an incision in the neck; such direct exposure permits accurate excision of the thickened scar tissue producing the stricture.

In those cases in which this precise method of reestablishing the normal dimensions of the laryngeal or the tracheal lumen is to be employed, it is distinctly advantageous to divide the course of treatment into three separate stages: (1) the surgical removal of the cicatrix; (2) the mechanical prevention of a tendency toward narrowing or constriction of the newly made lumen (over a long period, usually six months), and (3) the plastic closure of the external tracheal opening.

The difficulties which arise in the care of patients during these three stages of treatment, which are discussed at some length, are due, not to the want of techniques which are capable of producing creditable results, but to the need of a simplified form of treatment with fewer annoying technical details and fewer operative phases.

The author has developed a plan of therapy which in his experience is comparatively uninvolved, which is agreeable to the patient because it neither causes discomfort nor requires any form of laryngeal examination or manipulation during the prolonged second stage of treatment, and which has produced gratifying results in a high percentage of his cases.

NOAH D. FABRICANT, M.D.

Harrison, M. S.: Disease of the Cervical Spine in Laryngological Practice. *J. Lar. Otol.*, Lond., 1945, 59: 391.

Three cases of disease of the cervical spine are described. In 1 an osteoarthritis of the cervical spine with marked lipping of the vertebrae produced a prickly feeling in the throat on swallowing and stiffness of the neck. The lipping is demonstrated on roentgenogram.

In the second case osteomyelitis of the fourth and fifth cervical vertebrae developed with a sudden onset. The symptoms first appeared during eating. An ulcerating granulating lesion was seen in the right pyriform fossa just below the level of the arytenoid cartilage. The lesions of the vertebrae were demonstrated by roentgenograms. Epidural extension was indicated by sensory and motor changes in the upper and lower limbs. Treatment was carried out by neck fixation with a plaster-of-Paris collar and injections of penicillin, 20,000 units every four hours for six days, and a fortnight later a further course for four days, with a good result.

The third case was that of a nine-year-old child seen in a native hospital in Nigeria. The patient had a severe sore throat for a few days prior to the onset of the marked torticollis, scoliosis of the cervical region, and head fixation. Some weakness of the upper extremities was present. A plaster-of-Paris helmet was applied under anesthesia with traction therefrom for twelve weeks, and sulfanilamide was given orally.

The cervical vertebrae are a less frequent site for osteomyelitis than the lumbar and dorsal vertebrae. The majority of cases are hematogenic in origin but a small number are due to direct infection from an infectious process in the pharynx. The staphylococcus is the common organism. Retropharyngeal abscess is a common end-result; abscesses may also present at the posterior triangle of the neck or posteriorly through the cervical muscles. An epidural spread is common with abscess formation and segmental paralysis.

JOHN R. LINDSAY, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Kozol, H. L.: Pretraumatic Personality and Psychiatric Sequelae of Head Injury; Categorical Pretraumatic Personality Status Correlated with General Psychiatric Reaction to Head Injury Based on Analysis of 200 Cases. *Arch. Neur. Psychiat.*, Chic., 1945, 53: 358.

The medical profession and especially the psychiatrist have long been interested in the fact that certain persons develop mental states after head injury while others do not. It was Symonds who said, "It is not only the kind of head injury that matters, but the kind of head." This article from the Neurological Unit of the Boston City Hospital is one of a series of correlated investigations on this matter, and was undertaken by a team of neurologists, psychiatrists, social workers, and an electroencephalographer. Two hundred patients were selected from 430; those under fifteen and those over fifty-five years of age, chronic alcoholics, and the chronically unemployed were excluded. The type of head injury sustained, of course, varied, but among the cases were 46 with blood-tinged spinal fluid, 34 skull fractures, and 14 cases of focal injury with localizing neurological signs, in other words, an average group of cases seen in the head-injury ward of a large city hospital.

The various psychiatric definitions and limitations are not of special interest to anyone but a psychiatrist, but an adequate scheme of assessment was used. Certain interesting findings were made, among which was the lack of correlation between pretraumatic psychiatric symptoms and post-traumatic psychiatric symptoms. Lewis stated that the work history of patients was of value in estimating the pretraumatic personality. This was not borne out by this study because of 146 patients with a satisfactory work history, 63 per cent had no post-traumatic mental symptoms while 37 per cent had such symptoms. Symonds and Russell used the term "predisposition" in connection with patients having a peculiar personality or with those whose antecedents presented a psychiatric history. In this group there was only an 8 per cent difference in favor of such persons. There was, however, a substantial correlation between the existence of litigation and the development of psychiatric sequelae. Psychological factors had a definite bearing on the post-traumatic mental symptoms. ADRIEN VERBRUGGHEN, M.D.

Furlow, L. T.: Penicillin As An Adjunct to Surgery in the Treatment of Brain Abscess; A Report of 6 Cases. *South. M. J.*, 1945, 38: 312.

The author reports a series of 6 cases of intracranial abscesses treated at the United States Naval Hospital, San Diego, California. The pathogenic organism as obtained from cultures was the streptococcus in 3 cases and the staphylococcus in 2. There were many etiological factors present: frontal sinusitis, pneumonia with pleurisy, otitis media with mastoiditis (3 cases), and a compound depressed skull fracture.

The value of penicillin as an adjunct in the treatment of brain abscess is shown; however, it is stressed that penicillin is in no way a substitute for surgical evacuation of the pus. It may, however, alter somewhat the mode of attack. In the present series, 3 cases had only a single tap with aspiration of the pus, while the other 3 had open drainage with iodoform gauze wicks. The only fatality was the case secondary to frontal sinusitis, in which a second abscess was present, but as it was unrecognized it was not attacked surgically.

Although the general systemic reaction to the infection was improved on penicillin therapy, as evidenced by the subsiding fever and by a return to normal of the elevated white count, the increased intracranial pressure with its concomittant signs was relieved only after evacuation of the abscess. Penicillin was not injected into the abscess cavity after evacuation, but was usually administered intramuscularly every three hours. A total daily dosage of from 80,000 to 100,000 units was used. Recently the dosage has been 75,000 units daily in five doses of 15,000 units each. Intrathecal injections have been abandoned for recent evidence has shown that penicillin enters the spinal fluid. JACK I. WOOLF, M.D.

Tickle, T. G.: Surgery of the Facial Nerve in 300 Operated Cases. *Laryngoscope*, 1945, 55: 191.

This short article describes the author's technique and results in 300 cases of facial paralysis operated on since 1930. Two types of facial paralysis are responsive to surgery, one resulting from injury to the nerve, and the so-called Bell's palsy. When the nerve is injured, its distal end is identified after the tip of the mastoid process is removed; this is followed up to the injured part of the nerve which is also uncovered. The healthy proximal part of the nerve is identified and the length of the gap is noted. An anterior cutaneous branch of the femoral nerve of appropriate length is used to bridge the gap. No form of 'glue' is employed to join the ends, nor is any suture used. A gold-leaf dressing is applied and this must be carefully changed and supervised.

For patients with Bell's palsy who have lost their response to the faradic current, the decompressive operation with splitting of the sheath is employed. Function usually returns in two or three months' time. Galvanic massage is employed as after-treatment with support of the facial musculature by means of a hook in the corner of the mouth fastened to a head band. Diligent exercises in front of a mirror are recommended. ADRIEN VERBRUGGHEN, M.D.

MISCELLANEOUS

Tedeschi, C. G.: Cerebral Injury by Blunt Mechanical Trauma; Effects of Repeated Impacts of Minimal Intensity, with Observations on Experimental Animals. *Arch. Neur. Psychiat.*, Chic., 1945, 53: 333.

The author has made an experimental study, with the use of albino rats, to determine the effects of blunt mechanical trauma to the head. Brain injuries have been said to occur either by distortion of the skull or by movements of the brain within the skull. An attempt has been made to determine the possibility of different effects from the two mechanisms of trauma by studying the results of repeated impacts both in close succession and at longer intervals. These studies were made on animals in which a distortion of the skull, even in slight degree, was likely to occur under the force of the impact, and on animals in which forces of acceleration mainly were involved. Various degrees of trauma were employed, including lethal trauma (both immediate and delayed), concussive trauma (maximum sublethal trauma), single subconcussive trauma, and repeated subconcussive trauma, at long intervals and in close succession. Pathological studies were subsequently made to determine the effects of these various types of trauma on the cerebral cortex.

Rats recovering from single blunt impacts without damage to the skull consistently revealed widespread microscopic evidence of neuronal injury affecting, in a disseminated fashion, both nerve cells and nerve fibers. The author suggests that concussion may be due to neuronal injury, which is detectable with present histological methods, rather than the result of multiple petechial hemorrhages.

Repeated blunt impacts, the strength of which each alone was not sufficient to harm the animal, began to reveal ill effects after a certain number of blows, as shown by unconsciousness with or without recovery, at times by other persisting functional disorders, and later even by death. The postmortem changes seldom revealed hemorrhage in these animals, but evidence of a widespread neuronal injury affecting in a disseminated fashion both nerve cells and nerve fibers, accompanied with loss of myelin, and in the later stages with glial proliferation, was a consistent microscopic observation. Microscopic evidence of such neuronal damage could be detected as early as from one to two hours after injury, and in a few cases was seen to persist as long as two months after trauma. In the production of concussion by a single blow, no pronounced difference was noticed in the effects when the impact was delivered on a stationary head and when it was delivered on the head in rapidly accelerated motion with a trauma of the same momentum. HOWARD A. BROWN, M.D.

Evans, V. L.: Electroconvulsive Shock Therapy and Cardiovascular Disease. *Ann. Int. M.*, 1945, 22: 692.

It would seem that the induction of convulsions in patients with cardiovascular disease would be a hazardous procedure. The author, however, has studied 38 cases of known cardiovascular disease which were treated by electroconvulsive shock therapy with very few complications.

Nineteen patients with "presumptive to positive evidence" of coronary artery disease, withstood the procedure with no untoward manifestations. In 4 of 5 cases with auricular fibrillation, there were no difficulties despite previous episodes of decompensation in 2. One patient, a fifty-year-old emaciated woman, had a sudden exodus seven days after her last treatment. An autopsy was not performed. In a group of 9 cases with hypertension and a systolic blood pressure over 200 mm. of mercury presented no difficulties. Previous cerebrovascular accidents did not influence the effects of this therapy in 3 patients.

A seventy-year-old woman without evidence of cardiac disturbance and presenting a normal electroencephalogram, but with generalized arteriosclerosis, developed auricular fibrillation after 12 treatments. A further series of ten treatments given eleven months later had no untoward effects.

The conclusion is thus reached that electroshock therapy can be given with remarkably little danger in cases of organic disease of the cardiovascular system. JACK I. WOOLF, M.D.

SURGERY OF THE THORAX

TRACHEA, LUNGS, AND PLEURA

Geever, E. F., Carter, H. R., and Neubuerger, K. T.: Roentgenological and Pathological Aspects of Pulmonary Tumors Probably Alveolar in Origin, with Report of 6 Cases, One of Them Complicated by Torulosis of the Central Nervous System. *Radiology*, 1945, 44: 319.

Pulmonary alveolar-cell tumors are believed to be relatively rare among primary chest tumors. They are characterized by apparent lack of involvement of the bronchial tree and by evidence of circumscribed or diffuse intra-alveolar origin and growth. Shinall, in a recent report of lung tumors, states he did not see a single case of pulmonary alveolar carcinoma during a five-year period. While rare, its infrequent observation may, in part, be due to intrinsic difficulties of premortem radiological and clinical diagnosis. This report presents 6 cases of alveolar-cell tumor and discusses the differentiation from bronchiogenic and metastatic tumors and infections which present a similar x-ray picture.

Six cases of apparent pulmonary alveolar-cell tumor are presented. In case 1, typical of the multiple nodular type of alveolar-cell tumor, the symptoms were similar to those of bronchiogenic carcinoma—cough, pain in the chest, loss of weight, weakness, and dyspnea. The roentgenogram showed a large pleural effusion on the left side, and small, scattered radiopacities in the right lung, suggestive of metastatic tumor invasion. Bronchoscopy was negative and microscopy failed to show any bronchiogenic origin. Both lungs were studded with firm, gray nodules about 0.3 cm. in diameter. No other source of primary tumor was found. The liver and adrenal glands were filled with similar tumor nodules. This patient's total illness lasted about nine months.

The second case was also fairly typical of the multiple nodular type except that the symptoms were predominately due to cerebral and meningeal metastases. This patient had a clinical torulosis which probably made this the first reported case of its association with alveolar-cell tumor of the lung. The chest x-ray of this patient disclosed multiple small areas of increased density distributed throughout the upper three-fourths of both lung fields. These lesions were not characteristic of tuberculosis, but more like the findings in a fungus infection. At autopsy, three months after admission, both lungs were studded with numerous firm, gray, round tumor foci from 0.5 to 1.0 cm. in diameter and occasionally encroaching on the pleura. The bronchi and mediastinal nodes were free of tumor, but the leptomeninges and the brain showed scattered foci of tumor, some with central softening. At autopsy, no cryptococci were demonstrated and no torula meningitis was found.

The third case was also the nodular type found in a girl of seventeen. Her chest x-rays showed extensive nodular infiltration in the right middle and lower lobes and almost complete radiopacity of the left lung with shift of the heart and trachea to the left and elevation of the left leaf of the diaphragm. At autopsy, the left lung and right middle and lower lobes were occupied by a grayish, firm, nodular tumor with sclerosis of the intervening tissue. The nodules varied from pin head size to 1.0 cm. in diameter. There was no bronchial or metastatic involvement and the tumor showed less cellular anaplasia than the tumors in the first 2 cases.

The fourth case was characteristic of the diffuse form of tumor, but the diagnosis was obscured by an associated type III pneumococcus pneumonia. The roentgenogram showed extensive infiltrative consolidative changes in the left middle and lower lobes. A diagnosis of pneumonitis with bronchiectasis was made, although tuberculosis with bronchiectasis and tumor with pneumonitis and bronchiectasis were considered. After a steady downhill course, the patient expired, and a mixed grayish-yellow and white, firm tumor (10 by 10 by 14 cm.) was found in the anterolateral portion of the right upper lobe. Metastases were found in the peripancreatic lymph nodes, pancreas, adrenal glands, and kidneys.

In the fifth case, distant metastases were absent. The roentgenogram showed a large oval area of infiltration and consolidation over the left hilus with extensive peribronchial infiltrative changes radiating from the left hilus throughout the left lung. The roentgen diagnosis was primary malignant tumor, apparently originating from the left hilus. At autopsy some of the tumor structure was suggestive of a bronchogenic adenocarcinoma although no starting point was found in the bronchial system.

The roentgenogram of the last case, a nodular type of tumor leading to widespread metastases, showed both lung fields to be studded with multiple round or oval areas of increased density, partly confluent, which ranged from the size of a millet seed to that of a cherry. This patient received deep x-ray therapy in two series of treatment to the chest, more for diagnostic rather than therapeutic value. Improvement was only temporary, and the patient's course continued downhill until he died several weeks later. At autopsy a primary multiple alveolar-cell tumor of both lungs with metastases to the mediastinal and periaortic lymph nodes, liver, and kidneys was found.

Some 24 cases of alveolar-cell carcinoma have been found in the literature by Neubuerger and Geever; and Dacie and Hoyle and Wood have added 2 more cases. The authors prefer the name "alveolar-cell tumor" rather than "alveolar carcinoma" since histologists do not agree as to the presence or character of alveolar lining cells, the epithelium from which these tumors arise according to some authors.

Microscopic examinations in these cases favored the belief that the origin of the neoplastic growth

was in the alveolar walls. Opponents of this theory hold that these neoplasms arise from a single focus, probably in a small bronchus, and then metastasize rapidly to other parts of the lungs by way of down growth in the bronchial tree and by extension through the pores of Kohn, the lymphatics, and the blood vessels.

In spite of the argumental points, the authors believe these reported cases differ so from other forms of pulmonary tumors that they should be given special consideration.

The majority of alveolar-cell tumors are malignant but some are borderline or histologically benign. Sims, Bell, Taft and Nickerson reported cases probably of this character, calling them "bilateral multiple pulmonary adenomatosis," "extensive diffuse epithelization of the alveoli," and "pulmonary mucous epithelial hyperplasia." The third case reported here was somewhat similar, with a lower grade of histological malignancy, marked mucinous secretion, and absent regional and distant metastases.

The clinical features of this tumor are similar to other lung tumors, e.g., cough, bloody sputum, pain in the chest, pleural effusion, and cyanosis. Even in relatively benign tumors the outcome may be fatal because of the involvement of large lung areas or secondary infectious processes. The prognosis then is unfavorable in the overwhelming majority of cases, although unilateral or monolobar tumors may be amenable to surgical or x-ray treatment.

Microscopically these tumors consist of anaplastic columnar or cuboidal epithelial cells that line fairly well preserved alveolar walls and framework. The cells often form papillary projections. Mitoses are present. Occasional bronchi reveal nests of tumor cells in the submucosa. Thrombosis, inflammation, and early abscess formation are often seen. Giant cells, fragmented nuclei and desquamation of tumor cells into the alveolar lumina are seen. The lymphatics occasionally contain tumor cells. Pseudostratification and mucinous secretion are common. Marked fibrosis of the intervening lung tissue may be shown. Alveoli may contain macrophages and leucocytes.

From the roentgenological point of view the protein appearance of the alveolar-cell tumor makes the difficulty of conclusive diagnosis evident. The roentgenological appearance may simulate bronchogenic carcinoma, metastatic tumor, fungus or tuberculosis infection, or pneumonia. Effusion, bronchiectasis, or cavitation are often a direct result of the tumor and confuse the x-ray picture. Often complications having no association with the tumor, such as pneumonia or torulosis, lead to further difficulty in x-ray diagnosis.

Clinical factors such as lack of fever, loss of weight, progressive weakness, and a chronic course may tip the scales in favor of a tumor diagnosis; but as far as alveolar-cell tumor of the lungs is concerned, the diagnosis in the majority of cases lies beyond the realm of the x-ray differentiation and can be made only by microscopic examination. However, in patients with multiple nodular, seemingly metastatic shadows without evidence of a primary tumor elsewhere, this tumor should be suspected.

ROBERT R. BIGELOW, M.D.

Jackson, C. L., Konzelmann, F. W., and Norris, C. M.: Bronchial Adenoma. *J. Thorac. Surg.*, 1945, 14: 98.

The authors, in recently reviewing their records, found 20 cases typical of the clinical and pathological entity known as benign adenoma of the bronchus, and they present the essential features of these cases in a table in this article. The symptoms are usually hemoptysis and cough, often productive. The roentgenogram was negative in a few instances, but generally showed obstructive atelectasis and occasionally effusion. The ages of the patients varied from thirteen to forty-four years, and 80 per cent of the patients were women. Bronchoscopic biopsy was done in all of the cases, but the tissue was by no means diagnosed correctly the first time the slide was examined. In fact, it was quite interesting to note the various diagnoses made by different pathologists and on different occasions by the same pathologist for many of these cases. The authors believe that they have made some progress toward simplifying and standardizing the criteria for diagnosis and present their article with this in mind.

Numerous contributions to the recent literature have tended to cause confusion among pathologists and surgeons alike concerning the histological structure of these tumors. Bronchial adenomas show a peculiar epithelial proliferation in an equally peculiar stroma:

1. The cells are cuboidal, sometimes even columnar, arranged as a lining layer in variously sized spaces. They may form two or more layers or fill the space entirely. Within the first layer are often polyhedral cells and there may be apparent free cells of irregular outline. The cells often are so closely packed that cytoplasmic outlines are unrecognizable.

2. The nuclei are round or oval, and while often light-staining with delicate chromatin markings, they are frequently pyknotic and smaller with deep staining so that the chromatin markings are not distinguishable. Mitoses are not seen.

3. The tumor regresses sometimes as evidenced by density or fibrosis with shrinking of the cells and pyknosis of the nuclei. The nuclei are then oval-shaped, stain blue-black, and are closely packed.

4. Occasionally, in the rapidly growing tumors, the glandular pattern is not so clear.

5. Sometimes papilla-like masses are seen either as solid cords of cells or with the epithelium arranged on either side of a blood vessel. These on cross-section look like the pseudorosettes seen in tumors of the nervous system. One is impressed by the constancy of size and shape of the nuclei except when regression has occurred (Fig. 1).

The stroma is often dense and poor in cells where regression has occurred; but frequently, it is rich in

capillaries and shows interstitial hemorrhages and proliferating fibroblasts are found to invade the clot and surround the tumor masses. It may be that these fibrous growths which promote regression for the denser areas often contain hemosiderin deposits. Where hemorrhage has not occurred, the capillaries wind in and out around the acinus-like structures which gives a picture closely resembling fetal lung.

Rarely, the active proliferating capillary endothelium, which may show mitoses, will confuse and lead to an erroneous diagnosis. The authors have encountered bone and cartilage in one tumor, but never have they found proliferating muscle cells. It is believed that these tissues are incidental and not a true part of the tumor.

The authors believe that these adenomas may infiltrate the bronchial wall or any tissue in their path. This infiltration is sufficiently infrequent and limited when it occurs that endobronchial removal is justified when possible. Complete removal often is impossible, and, if incomplete, the tumors recur. However, repeated removal does not seem to cause more rapid growth or to alter the behavior of the remaining cells. There is no evidence of metastases carried by the blood or lymph stream. It is possible these tumors may become malignant, but the authors have never seen malignant change occur. Diagnostic accuracy depends on the pathologist's seeing the whole picture; therefore, the entire tumor, if small, or numerous fragments, if large, should be studied by serial sections.

Since the clinical picture may only be suggestive, the final diagnosis in these cases must be made by bronchoscopy with biopsy. Needle biopsy is not adequate, and lobectomy and pneumonectomy should never have to be done to establish the diagnosis, regardless of the indications for lung resection in treatment. It is well known that 75 per cent of lung carcinomas can be subjected to a bronchoscopic biopsy. These figures do not apply to all adenomas since they characteristically occur in portions of the bronchial tree accessible to bronchoscopic inspection.

Once the diagnosis has been made, several additional bronchoscopies should be done to relieve bronchial obstruction. This is accomplished by piecemeal forceps removal, by electrocoagulation, or a combination of both. Electrocoagulation produces less bleeding and is safe and more efficient in most cases. The authors often found it more advantageous to alternate forceps removal with electrocoagulation.

When the tumor can be removed bronchoscopically with drainage and reaeration of the distal bronchial tree, more radical treatment may be postponed. All patients should be kept under observation and re-examined at intervals, since complete removal with the bronchoscope is difficult and, in many cases, impossible. The authors stress that if drainage and aeration is accomplished, there is no urgent need for the use of more radical measures. In some cases, the bronchus will remain open without further treatment; in others, only occasional subsequent treatments are needed.

The authors believe that lung resection is indicated (1) in cases of bronchial adenoma in which, because of sessile attachment and size, bronchoscopic removal is not feasible, and (2) in cases in which cavitation, bronchiectasis, or other severe damage to the distal portion of the lung has resulted from prolonged bronchial obstruction.

A very different situation obtains in the case of bronchial adenoma than in the case of carcinoma as far as urgency is concerned, provided drainage and aeration can be re-established. The adenoma is slow-growing, does not metastasize, and does not have any inherent tendency to become malignant. Any contrary opinion has been due to error in histopathological diagnosis. ROBERT R. BIGELOW, M.D.

Graham, E. A., and Womack, N. A.: The Problem of the So-Called Bronchial Adenoma. *J. Thorac. Surg.*, 1945, 14: 106.

The so-called bronchial adenoma is now known to be a common tumor with well recognized characteristics. It nearly always occurs in a primary bronchus or close enough to one to be visualized by the bronchoscope. Atelectasis of a lobe or lung is common and not infrequently the bronchial obstruction causes an associated bronchiectasis. Women are affected slightly more often than men, a contrast to the preponderant male incidence of carcinoma. Usually the symptoms appear earlier than in ordinary carcinoma, even in childhood and adolescence. The bronchoscopic picture is typical, showing a smooth, rounded, pink mass with a broad base projecting into the lumen of the bronchus. Often only a small portion of the tumor is endobronchial, most of it being outside of the bronchus. Ulceration is rare even though hemoptysis is a common symptom. There seems to be a strong association of bronchial adenomas with other congenital lung abnormalities, such as absent interlobar fissures or excessive lobulation, congenital cystic disease, or abnormal bronchi.

There is a fairly definite microscopic pattern. The tumor is covered with bronchial epithelium which often shows squamous metaplasia. Directly beneath this there is a fibrous tissue layer of varying thickness, often edematous. The main tumor mass consists of cells with scanty cytoplasm and small round, darkly staining nuclei with rare mitoses, arranged similarly to fetal pulmonary alveoli. These alveoli are separated by a stroma of blood vessels and loose edematous fibrous tissue. The cells are often cord-like and there is a striking similarity to hypernephroma, which probably accounts for some misdiagnoses. When the stroma is excessively vascular, the tumor appears angiomatous, and it has often been diagnosed as an endothelioma. In some tumors, the stroma has been dominated by mesoblastic cells with the result that areas of fibrosis, smooth muscle, fat, fibrous and hyaline cartilage, and even bone have been seen. In this tumor, sections from different areas reveal very different appearances.

The striking resemblance of these tumors to fetal lung suggests that they may be derived from disor-

ganized embryonic buds which have failed to develop normally or have atrophied. The fact that these adenomas have many characteristics like the mixed tumors of the salivary glands led to the authors' calling them "mixed tumors of the lung," in 1938. These characteristics are the presence of cartilage or bone, the tendency to invoke neighboring tissues directly, and the occasional tumor formation by the connective-tissue elements. Pathologists might question this last characteristic, but the authors believe that many cases of chondroma, fibroma, lipoma, myxoma, and even sarcoma of the lung, originate in the so-called adenoma or "mixed tumor" of the bronchus, but in which mesodermal elements proliferate with the corresponding epithelial proliferation.

In accordance with the authors' ideas, two main groups of pulmonary tumors can be thought of as occurring because of failure of a bronchial bud to develop into a normal adult arrangement of tissue. These groups are (1) those in which mesodermal elements predominate, such as pulmonary chondroma, osteoma, fibroma, lipoma, angioma, myxoma, and sarcoma and (2) those in which entodermal (or epithelial) elements are dominant, illustrated chiefly by the bronchial adenoma. This would explain the extreme frequency with which epithelial elements are found in the so-called chondroma of the lung, and mesodermal elements are found in the epithelial tumors.

The chief clinical problem concerning these tumors is whether they are actually or potentially invasive. If one accepts invasion of the adjacent tissues, regional lymph-node involvement, and distant metastases as criteria of malignancy, in the light of considerable experience one cannot deny that there have been cases in which these tumors became malignant.

In 1938, the authors' opinion was that these adenomas were potentially malignant, and they reported 7 cases in which invasion of the adjacent tissues or involvement of the regional lymph nodes occurred. Kirch, von Pein, Malkwitz, Anderson, Stowell, and Adams, Steiner, and Block all have reported cases of malignant changes in so-called lung adenomas.

The authors present a case in which an adenoma had pursued a benign course for more than twenty years before it became malignant. At one time it appeared that the tumor had been completely removed through the bronchoscope, but an extensive carcinoma with liver metastasis eventually developed.

Another case is presented in which the diagnosis of a mixed bronchial tumor made up chiefly of epithelial elements was made by bronchoscopy. A total pneumonectomy was done with difficulty because the hilar glands were involved. This diagnosis was confirmed by microscopic section and at autopsy two days later when metastatic carcinoma of the tracheobronchial lymph nodes and liver was found. The authors believe this case is an example of an adenoma of the bronchus which has become malignant with metastases to the regional lymph glands and liver. They conjecture that if it had been seen early, before metastases developed, it would have been called a benign adenoma of the bronchus.

The final case presented is of an obstructing papillary tumor of the right upper-lobe bronchus found on bronchoscopy. The patient underwent a right total pneumonectomy and recovered. Of great interest was the pathological specimen, since gross examination revealed no evidence of tumor in the adjacent lymph nodes. The microscopic sections showed an extremely bizarre malignant tumor of the lung in which both epithelial and connective-tissue elements were taking part. A final diagnosis of mixed bronchogenic carcinoma and sarcoma was made. The authors believe this to be an outstanding example of a malignant transformation of a tumor, which if seen earlier would have been called a bronchial adenoma. More interesting is the fact that both epithelial and connective-tissue elements have become malignant, which is support for the authors' theory that either the entodermal or mesodermal elements of a latent bronchial bud may take on the features of a neoplasm and that either type of element may become malignant. The presence of bone in this mixed carcinoma and sarcoma supports further the use of the term "mixed tumor" of the bronchus.

These tumors, when first seen, are usually found to be benign and some of the individuals harboring them may fulfill their normal life span, the tumors not becoming malignant. Although there is evidence that a patient has had symptoms from such a tumor for twenty years, it is rare to find a bronchial adenoma at autopsy after middle age. The reason for this probably lies in the fact that the majority of these tumors become malignant and often lose their original identity. In this respect, an adenoma of the bronchus would be merely following the rule of what is well established in regard to adenomas of the breast, prostate, thyroid, and rectum.

In view of the well established malignant potentialities, radical surgical removal is clearly the procedure of choice. Bronchoscopic removal rarely could be complete because of the frequency with which a large part of the tumor lies outside of the bronchus. There is the additional hazard of bronchial perforation with bronchoscopic removal. If the tumor is not completely removed, the remainder may later become invasive. Another objection to local removal is the uncertainty in many cases as to whether the tumor is actually malignant at the time of operation. Tissue removed by bronchial biopsy may not be clearly malignant even when the tumor has already invaded neighboring tissues or regional lymph nodes. Bronchoscopic removal may be unsatisfactory also because of the associated bronchiectasis supposedly due to bronchial obstruction by the tumor. Lobectomy will sometimes be adequate, but because of the location of the tumor, total pneumonectomy will more often be necessary. This is a procedure by which involved regional lymph nodes can be removed more easily and which in good-risk patients is only slightly more dangerous than lobectomy.

ROBERT R. BIGELOW, M.D.

Bloch, R. G., Adams, W. E., Thornton, T. F., and Bryant, J. E.: Difficulties in the Differential Diagnosis of Bronchogenic Carcinoma. *J. Thorac. Surg.*, 1945, 14: 83.

Recently the increasing interest in lung carcinoma has led to much improvement in the diagnosis of pulmonary tumors. With better x-ray technique and bronchoscopy, their differentiation from other lung involvements has become comparatively easy and fewer patients with endobronchial cancer die because of erroneus diagnosis. With mounting experience in the many clinical and pathological variations of such tumors and especially with the desire for early discovery, it is apparent that a considerable number can not be definitely recognized by conservative diagnostic methods. Large scale, routine x-ray examinations are beginning to show an increasing number of small findings of doubtful significance and origin, but it is hoped that when these examinations of supposedly healthy individuals become universal, there may emerge a preponderance of such lesions over the far advanced ones now being seen.

Routine chest fluoroscopy as a case-finding program for tuberculosis at the University of Chicago Clinics has proved most helpful in the discovery of nontuberculous chest involvement, and the authors believe that the procedure would be justified for the sole purpose of uncovering cardiovascular disease and tumor involvements. Of 15,000 patients, 91, or 0.6 per cent were found to have intrathoracic neoplasms. One-third of these were classified as metastatic growths, while one-fourth were later diagnosed as primary bronchogenic carcinomas. It is interesting to note that one-half of these cases were assigned to clinics where physical examinations expected to lead to the diagnosis are not carried out. The overwhelming majority of patients with early tumors do not show any physical findings, and most of these patients had complaints unrelated to the chest. Among hospitalized cases, pulmonary tumors have been found which could not be connected with the patient's history. This has been due largely to the fact that an increasing number of chest x-rays are being taken.

The fact that increasing numbers of patients are being saved by improved surgical technique, places increased responsibilities on physicians for early diagnosis of lung tumors. This article recommends early diagnosis and the using of all available diagnostic methods as soon as suspicious chest lesions are discovered. That the diagnosis may be difficult even in advanced cases is shown by some of the cases presented. They show that x-rays, invaluable in discovering the lesion, in no case can offer a reliable differential diagnosis. They also show frequent failure of bronchoscopy or bronchobiopsy, the only conservative method of diagnostic proof when the tumor is accessible to the instrument.

If early carcinoma, like tuberculosis, does not involve large bronchial elements, it is not likely to produce symptoms for a long time, or if it does, they are so mild and insignificant that they are usually disregarded by the patient. Roentgenological examinations often will not differentiate them from small tuberculous or nontuberculous inflammatory lesions. Early peripheral lesions constitute 13 per cent of the total lung tumors and bronchoscopy is always negative in these carcinomas. The prediagnostic history of some of the cases illustrates the seeming insignificance and obscurity of early carcinoma, and some of the problems in more advanced lesions when complicated by unrelated disease.

An impressive number of symptoms and findings have been described as those of bronchogenic carcinoma, but these should not be taken as typical and certainly do not apply to early peripheral tumors. In fact, even the x-ray observation of the development of the tumor through various stages may not only help, but also obscure, the diagnosis when there is a resemblance of two or more diseases in their various phases. X-ray examination, while invaluable in detecting the lesion, cannot be relied on to differentiate between neoplasm, lung abscess, tuberculosis, and other rarer lung involvements. Therefore, surgical exploration alone, in the absence of bronchoscopic findings, can lead to a diagnosis and it should be undertaken even in early cases when there is a strong enough possibility of neoplasm. The x-ray observation through long periods seemed to emphasize the diagnostic difficulties, and its greatest single value lies in the discovery of the early presymptomatic lesions by routine examination of large population groups.

ROBERT R. BIGELOW, M.D.

Schneider L., and Reissman, I. I.: Idiopathic Spontaneous Pneumothorax; History of 100 Unselected Cases. *Radiology*, 1945, 44: 485.

The writers have been impressed by the frequency with which a history of spontaneous pneumothorax is obtained from selectees from 18 to 38 years old who appeared for induction examination. About 1 in 500 men gave a verified history of this condition.

That so-called idiopathic spontaneous pneumothorax rarely results in pulmonary tuberculosis is now well known. Many of the men who had suffered such pulmonary collapse in the past, however, were unduly alarmed about it, having been advised unnecessarily to lead a cautious sedentary life.

The authors believe that these cases should be treated like the accidents they really are. Once the patient has recovered, nothing more serious will happen than a possible recurrence of collapse, after which, as a rule, a subsequent attack is uncommon. Invalidism or chronic lung disease is rarely a sequel.

The authors made a study of 100 unselected cases of spontaneous pneumothorax of the so-called idiopathic type, which had occurred in selectees for military service from months to years before the induction examination.

The right lung was involved in 55 cases, the left lung in 44. One patient gave a history of bilateral pneumothorax. The condition occurs most commonly in the age group between twenty and thirty years.

Spontaneous pneumothorax may appear asymptomatically, as found in 5 per cent of the authors' series. From its discovery on routine chest roentgenograms, it may be assumed that this accident is more frequent than clinically supposed.

Recurrences take place in about 20 per cent of the cases, and on the same side. Recurrence was uncommon in men over thirty years of age.

Spontaneous pneumothorax occurred more often in the authors' series during relatively slight physical exertion or with the patient at rest than following undue physical stress or strains.

Roentgenograms of the lungs taken from months to years after re-expansion of the collapsed lung were negative in all but 4 instances. In the great majority of cases, one cannot tell from the film that a pneumothorax ever existed, nor could it be predicted from the film whether or not the patient would sustain a future recurrence. On the contrary, numerous cases of bullous emphysema seen at the induction station gave no history of spontaneous pneumothorax.

JOSEPH K. NARAT, M.D.

Blades, B., Hamilton, J. E., and Dugan, D. J.: Observations on the Treatment of Empyema Thoracis with Penicillin. *Surgery*, 1945, 17: 572.

When the possibilities of altering the management of empyema by the use of penicillin are considered, the questions of adequate drainage and irrigation are most important. The prevailing tendency in the treatment of empyema with penicillin has been to delay drainage and therefore decrease the chance of premature operation in the case with an abscess in the formative stage. Moreover, the use of penicillin will control quickly the pneumonic stage of the disease and consequently decrease the risk of any type of surgical intervention.

There is indisputable evidence that penicillin is a valuable adjunct in the treatment of empyema thoracis caused by penicillin-vulnerable organisms. Systemic administration of the drug alone will sometimes cause cultures of the fluid in the chest to become sterile. Intrapleural injections of penicillin will temporarily sterilize an empyema cavity in the great majority of cases. However, a combined systemic and intrapleural administration is desirable because the combined routes affect both the pulmonary and pleural lesions.

Probably penicillin will be extremely effectual in aborting empyema formation, but once pus is formed and continues to form, even if sterile, the problem of cavity closure cannot be ignored. If healing is not rapid with the disappearance of pus when conservative measures are employed, the authors believe that surgical drainage is mandatory. Failure to observe the fundamental principle of adequate drainage of any pyogenic empyema, even if the pus is rendered temporarily sterile by penicillin, will invite the serious complication of chronicity. This occurred in 2 of 24 cases observed.

It should again be emphasized that the introduction of penicillin has not altered in any way the fundamental principles of treatment of empyema; only the details are changed.

BENJAMIN GOLDMAN, M.D.

Blades, B.: Penicillin as an Adjunct to the Surgical Treatment of Acute and Chronic Empyemas. *Ann. Surg.*, 1945, 121: 672.

ACUTE POSTPNEUMONIC EMPYEMA

Observations indicate that when suppurative pleuritis is caused by penicillin-vulnerable organisms, intrapleural injections of penicillin will temporarily sterilize the pus. If the pus continues to thicken, however, it is usually necessary to resort to surgical drainage to evacuate the material. If this is not done, a chronic empyema may develop and, regardless of the sterility of the pus, the same problem of cavity obliteration remains to be solved.

As experience with penicillin therapy accumulates, the therapeutic approaches will become more standardized. Based upon the author's observations, a tentative plan for the use of penicillin as an adjunct to the surgical treatment of acute empyema is suggested.

1. An injection of 50,000 units of penicillin may be given intrapleurally as soon as an infected fluid appears in the pleural cavity. It is important that treatment be withheld until the organism is positively identified. This precaution will prevent the waste of penicillin in infections which do not respond to the drug, and an initial bacteriological diagnosis will also rule out the possibility of a tuberculous effusion or empyema.

2. If systemic penicillin has been employed during the pneumonic stage of the disease, the author believes it should be combined with local therapy. It is admitted that in many instances the pneumonic phase will have subsided by the time an empyema becomes apparent. The advantage of the systemic route, however, is that the blood will contain an antibacterial inhibitory substance which may control spreading cellulitis or invasive infection. It is the author's opinion, therefore, that systemic administration of penicillin should always be combined with local therapy. This is true particularly in cases of streptococcal and staphylococcal empyemas. Probably three intrapleural injections of 50,000 units on alternate days is sufficient for local treatment. Before the penicillin is injected into the pleura, as much of the infected fluid as possible should be removed by thoracentesis. If the pus continues to form and thickens, surgical drainage should be established. Temporary or even permanent sterilization of the pus does not alter the most important fundamental surgical principle in treating empyema thoracis, namely, adequate drainage.

CHRONIC EMPYEMA

After adequate drainage of a chronic empyema cavity has been established, it appears that neither the local nor systemic administration of penicillin is important. During the period of observation to de-

termine whether the cavity will become obliterated without further surgical intervention, there is little danger of spreading cellulitis or invasive infection. Continued fever and failure to gain weight and other manifestations of sepsis usually mean an undrained or inadequately drained collection of pus. No chemotherapeutic agent can be depended upon to replace proper drainage in the treatment of pyogenic abscesses.

Probably the most valuable role of penicillin in the treatment of chronic empyema is the protection it may afford against spreading infection when a radical operation is undertaken for obliteration of the cavity. When penicillin is used as a prophylactic agent for this purpose, it is impossible to make a precise evaluation of its benefits. It seems reasonable, however, that when one is working through an infected or potentially infected field, penicillin protection may often prevent serious wound infections and other complications.

THE PREVENTION OF POSTOPERATIVE EMPYEMA IN CASES OF LUNG RESECTION

Since postoperative empyema is the principal cause of both mortality and morbidity after the resection of lung tissues, it is reasonable to utilize penicillin in an effort to reduce the incidence of this serious complication. When the mold first became available in limited quantities, the authors employed it in cases of empyema following pulmonary resection and were disappointed with the results. It was given both systemically and locally, but there was no positive evidence in 6 cases so treated that it had an appreciable effect upon the infection.

Recently the authors have had an opportunity to utilize penicillin as a prophylactic agent in patients subjected to lobectomy for suppurative diseases of the lung.

It is the author's impression that in their series of cases the incidence of empyema depended entirely upon the successful closure of the bronchus. If the bronchus opened early during the postoperative course, a serious empyema developed. If it did not, empyema was avoided, or if it did develop after the remaining lung had re-expanded it was not serious. The only other justifiable conclusion from this subject is that penicillin does not guarantee absolute protection from postoperative empyema in cases subjected to lung resection.

JOHN J. MALONEY, M.D.

HEART AND PERICARDIUM

Heuer, G. J., and Stewart, H. J.: The Surgical Treatment of Chronic Constrictive Pericarditis. *N. York State J. M.*, 1945, 45: 993.

Chronic constrictive pericarditis is a disease characterized by a chronic fibrous thickening of the pericardium which is so contracted as to interfere with the normal diastolic filling of the heart. The results of this interference with normal cardiac action are the signs and symptoms resembling heart failure. Pick, in 1896, emphasized the common findings in this disease of involvement of the liver and ascites and, therefore, it is often called by his name.

The idea that surgery might achieve results in a disease which has resisted the efforts of the physician is attributed to Weill, who in 1895 suggested that patients with it might be relieved by resection of the pericardium. Delorme, an internist who seems to have had unusual surgical instincts and whose name is widely known in connection with the operation of decortication of the lung for chronic empyema, not only suggested but insisted between the years 1895 and 1898 that surgery be attempted in this disease. His advice, however, was not immediately followed.

The cause of the thickened, contracted, adherent pericardium has been related to tuberculosis, pneumonia, sepsis, or a previous pericarditis with effusion, as in 5 of the authors' cases. Yet in most of the proved cases the antecedent cause of the condition has not been determined. The pathological process in the wall of the pericardium gives rise to a variety of lesions. The pericardium is always thickened, but the thickening may be variable in different parts, being slight in some areas, marked in others. The thickened pericardium may be made up wholly of fibrous tissue, or deposits of calcium may occur, and give rise to plaques, sheets, or a complete bony shell. It is the compression of the heart by its shrunken envelope that gives rise to the clinical manifestations of the disease.

The clinical manifestations commonly are dyspnea, increase in the size of the abdomen due to enlargement of the liver and ascites, and edema of the feet and ankles.

In all of the series of 18 cases here reported, enlargement of the liver occurred; ascites was found in 15, edema of the extremities in 11, and pleural effusion in 8. Dyspnea on exertion or at rest was present in 17, and cyanosis in 14. Distention of the peripheral veins and an increase in the venous pressure was present in all of the cases.

The leading clues to a correct diagnosis are the insidious onset of dropsy, particularly in young persons, the preponderant liver enlargement and ascites, the increased prominence of the jugular veins with increased venous pressure, the normal or relatively normal heart in the presence of a non-nephritic dropsy, the low pulse and blood pressures and the paradoxic pulse, the x-ray evidence of poor or absent cardiac pulsation and of pericardial calcification, and the electrocardiographic findings of low voltage, QR-S complexes, and T-waves.

All of the 18 patients with chronic constrictive pericarditis here considered were subjected to the operation of pericardiectomy. All recovered from the operation. Seven were cured in the sense that their symptoms and signs disappeared and they were able to lead normal active lives; 3, more recently subjected to operation, have so far recovered as to appear to be cured; 4 were markedly benefited, 1 was moderately benefited, and 4 were not benefited by the operation; 3 of the last have since died.

The literature records 256 patients subjected to operation with a primary mortality of 29 per cent. Of the fatalities, 25 occurred upon the operating table and 49 occurred during the immediate postoperative period. To have lost at once over one-fourth of the entire number of patients subjected to operation suggests that preoperative treatment leading to a proper selection of cases, and knowledge of and great attention to all the details in the operative procedure, have influenced profoundly the results of surgery.

The preoperative treatment, anesthetic, details of operative procedure, and postoperative treatment are discussed in detail.

JOHN E. KIRKPATRICK, M.D.

ESOPHAGUS AND MEDIASTINUM

Resano, J.: Infantile Megaesophagus (Megaesofago infantil). *Arch. argent. enferm. ap. digest.*, 1944, 19: 409.

The author recently operated on a case of megaesophagus in a child seven years of age. At the age of five she had begun to have dysphagia and vomiting. The case is illustrated with a photograph of the child and roentgenograms. Megaesophagus is frequently confused with esophagism or spasm of the cardia or lower part of the esophagus.

The author has collected 77 cases from the literature, 14 of which were rejected as doubtful; the other 63 considered authentic. Brief histories of these cases are given with a table showing the details of symptoms, treatment, and results.

Megaesophagus begins suddenly in infants and gradually in other children. The chief symptoms are dysphagia, vomiting, and pain. The vomiting is esophageal; the food does not reach the stomach and does not contain gastric juice. Inspiration of the contents of the esophagus into the bronchi may cause bronchitis or sometimes abscess of the lung or bronchiectasis. These children may be treated on a mistaken diagnosis of bronchitis, recurrent bronchopneumonia, or pulmonary tuberculosis. Sometimes the shadow of the dilated esophagus encroaches on the mediastinum and leads to a diagnosis of tracheobronchial adenopathy.

Diagnosis may be made clinically, by catheterization, esophagoscopy, or roentgenography, or only on autopsy. The best method of diagnosis is by roentgenography.

The best method of treatment is probably dilatation with a rubber bulb filled with water, the technique of which is described. This method has been used satisfactorily in 18 cases at the Mayo Clinic.

AUDREY G. MORGAN, M.D.

Hannan, L.: Mediastinal Emphysema. *J. Am. M. Ass.*, 1945, 128: 1.

Air may reach the mediastinum by 4 routes: (1) along the fascial planes of the neck, (2) through a perforation of the trachea, bronchus, or esophagus into the mediastinum, (3) from the retroperitoneal space, and (4) from the interstitial tissues of the lung. It has also been suggested that air may reach the mediastinum through a passage between the parietal pleura and the chest wall, or beneath the visceral pleura, or the air may pass from the pleural cavity to the mediastinum.

When air reaches the mediastinum and is confined there, it will gradually be absorbed. When sufficient pressure develops, however, air always escapes from the mediastinum, although the amount of the pressure is not the only effective factor; the location of the air within the mediastinum is important, since air escapes easily from certain locations and with difficulty from others. When air does escape from the mediastinum it may follow one of three paths: (1) into the subcutaneous and deep tissues of the neck; (2) through the diaphragm, about the aorta and the esophagus, to the retroperitoneal tissues; and (3) into the pleural cavities.

A small amount of air in the mediastinum may produce only trivial symptoms or none at all. Large amounts may cause a very grave disturbance and lead to death. The effects of increased mediastinal pressure are similar to those of increased intrapericardial pressure. As the pressure rises, the veins collapse, the inflow of blood into the heart is hindered, and, if the pressure rises sufficiently, the circulation of the blood comes to a standstill. As the circulation becomes impeded, dyspnea and cyanosis appear, and later pulmonary edema develops to aggravate these symptoms.

The signs of mediastinal emphysema are: (1) pain, (2) subcutaneous and retroperitoneal emphysema, (3) obliteration of cardiac dullness, (4) peculiar sounds heard over the heart, (5) evidence of increased mediastinal pressure—dyspnea, cyanosis, engorged veins, and circulatory failure, (6) pneumothorax, and (7) roentgenographic evidence of air in the mediastinum.

A small amount of air in the mediastinum is soon absorbed and requires no treatment. When pressure symptoms appear, however, it becomes imperative to furnish an exit for the trapped air. This result can be attained by merely making a deep incision into the tissues of the mediastinum through the jugulum, or by some similar simple method. An associated tension pneumothorax should be adequately treated either by frequent aspiration of the pleural cavity or by the constant maintenance of atmospheric pressure. This may be done by introducing a needle attached to a piece of tubing, the distal end of which is inserted into a bottle of water.

SAMUEL KAHN, M.D.

MISCELLANEOUS

Barrett, N. R., and Barnard, W. G.: Some Unusual Thoracic Tumors. *Brit. J. Surg.*, 1945, 32: 447.

The authors report their cases partly because they illustrate the expanding scope of thoracic surgery and partly because the lesions themselves may properly be described as unusual.

A man aged thirty-six was admitted to the hospital because of increasing dyspnea on exertion over a period of six months. He also complained of intermittent pressure behind the lower end of the sternum, but there was nothing to suggest pain of the anginal type. Roentgenographs of the chest revealed an opacity, about the size of an orange, situated in the right chest and lying in the angle between the right border of the heart and the dome of the diaphragm. The mass lay in the extreme front of the chest, immediately behind the sternum. The bronchial tree was shown to be normal by bronchoscopy and bronchograms, and the diaphragm was not paralyzed. The electrocardiograph was normal, and the possibility of a diaphragmatic hernia (through the foramen of the internal mammary artery) was not great because roentgenographs of the stomach showed no pathology. Opinion was divided as to whether the mass could be held to explain the man's symptoms, or whether the symptoms came from the mediastinum, the pericardium, the lung, the pleura, or the diaphragm.

Artificial pneumothorax sometimes settles a question of this type, by showing that the lung retracts with or without the mass, and, in the case of cysts such as may occur in connection with the parietal pleura, that the outline of the mass alters after air has been introduced into the pleural cavity. This method of investigation is not very satisfactory when the opacity lies adjacent to the mediastinum because the lung is attached to the central structures by the pulmonary ligament, and it may not uncover a mediastinal tumor even if adhesions are not present. Artificial pneumothorax can sometimes be usefully combined with pneumoperitoneum and thoracoscopy for purposes of diagnosis. An artificial pneumothorax was induced in this case, but it cast no additional light upon the diagnosis or upon the point of origin of the mass. Thoracotomy was performed under general anesthesia. The right pleural cavity was opened by a short intercostal incision and the mass was immediately located lying extrapleurally, in front of the pericardium, in the pad of fat which normally is situated in this area. It was found to be a thin-walled translucent cyst which contained clear watery fluid. The cyst was removed without difficulty and the chest was closed. At the conclusion of the operation air was aspirated from the pleural cavity so that no pneumothorax remained. Convalescence was uneventful. Such cases should be carefully distinguished from dermoid cysts and teratomas of the mediastinum.

A girl, aged eight, developed "chest trouble," which was diagnosed and treated as a case of pleurisy on the right side and pneumonia. This illness was slow to resolve. The films showed atelectasis of the right lower lobe. A bronchogram revealed a block of the right main bronchus about ½ inch below the carina. Bronchoscopy showed a tumor at the level indicated in the bronchogram; it was about the size of "the tip of one's little finger." The tumor was removed by avulsion with a forceps. The histological examination established the diagnosis of an adenoma of the bronchus. The child made a rapid convalescence, but the signs of atelectasis of the lower and middle lobes persisted. The question arose as to whether further treatment for the adenoma was desirable or necessary. Three alternative procedures were considered. Conservative treatment was discarded because it was assumed that, although bronchoscopy was negative at the time, there was certain to be an extrabronchial extension of the neoplasm and this, if ignored, would sooner or later grow into a dangerous tumor. The second suggestion was to insert radon into the bronchus, but this also was turned down because radon is now known to afford but temporary relief in the great majority of these cases, and in this particular patient the exact site of the lesion was doubtful and the placing of the radium would of necessity have been inaccurate. The third possibility was to do a lobectomy or pneumonectomy. Pneumonectomy was preferred because it was believed that the extrabronchial extension probably lay in the angle between the upper-lobe bronchus and the main descending bronchus, and because the lower and middle lobes of the right lung were known to be infected and bronchiectatic. Convalescence was uneventful and the child made a rapid and complete recovery.

This case was presented for two reasons. The first is the importance of realizing that the great majority of bronchial adenomas have an extrabronchial as well as an intrabronchial part and that this fact must be taken into consideration when treatment is planned. The second reason is that the average age of onset of symptoms in cases of adenoma of the bronchus is twenty-eight years and this patient was only eight years old.

The second case of adenoma of the bronchus is presented because of certain features which are of special interest:

1. The explanation of the recurring conditions of atelectasis and re-expansion of the lower and middle lobes was that they were partly due to the blocking of the main bronchus by the growing tip of the tumor and partly to the fact that portions of the tumor became necrotic, broke off, and were impacted in the lower-lobe bronchus. Thus it is obvious why at one time the whole lung was atelectatic, at another time only the upper and lower lobes were in this condition, and sometimes only the upper lobe was atelectatic.

2. This tumor was not established as an adenoma until the whole lung was available for microscopy. The fact that an oat-cell carcinoma had been diagnosed from the material secured at bronchoscopy, might have been disastrous to the patient, for it has been stated by some experienced thoracic surgeons that oat-cell tumors of the main bronchus metastasize so early to the mediastinal glands that thoracotomy is scarcely worth while. In this case the appearance of the papilliferous tumor at bronchoscopy and the normality of the carina were so suggestive of adenoma that a pneumonectomy was performed.

3. This tumor grew from a relatively small base into a pedunculated projection which occupied the whole of the upper-lobe bronchus; this particular arrangement is peculiar in that the pedicle was much longer than is usual.

4. In spite of the fact that the pleural cavity was contaminated by pus during the mobilization of the upper lobe, and the chest was closed without drainage at the end of the operation, the patient did not develop empyema.

While convalescing from a catarrhal jaundice, a three-year-old boy was said to have developed a "left pleural effusion." The signs indicated a solid or fluid lesion extending from the level of the third rib above to the dome of the diaphragm below. X-rays confirmed these signs and also showed that the heart was considerably displaced into the right chest. A bronchoscopy was carried out under general anesthesia; the bronchi of the left lower lobe were displaced upward and outward, but no intrabronchial abnormality was detected. Bronchograms did not afford additional information except that they confirmed the opinion that the lesion was extrapulmonary. The most likely diagnosis was considered to be a mediastinal tumor, and, of the various possibilities, the lobulated outline suggested a teratoma or a benign tumor such as lipoma. Thoracotomy was done under general anesthesia. The tumor lay in front of the heart, and extended along the diaphragm to the lateral chest wall. It was yellow in color, lobulated, solid, and with a number of small secondary excrescences upon its surface. Removal of the tumor was not difficult. The chest was closed without drainage and, when the air in the pleural cavity had been aspirated, the general condition improved rapidly. Histologically the tumor was a lipoma.

A forty-year-old woman was admitted with complaints of a productive cough of nine months' duration, a feeling of heaviness in the right chest, dyspnea upon exertion, and increasing weakness. Elsewhere a diagnosis of a pulmonary hydatid cyst or a peripheral tumor of the lung had been made. Roentgenography of the chest showed a tumor in the right chest. Bronchoscopy revealed nothing abnormal in the bronchial tree. There was no evidence of metastases. The patient had on one occasion coughed up a dark-red object about the size of her forefinger which was recognized as a bronchial cast containing masses of malignant cells. The right lung has been removed. When seen one year later, the patient was in good health. The pathological report was mixed carcinoma and sarcoma of the lung. The two types of tissue were closely mixed.

JOSEPH K. NARAT, M.D.

Thornton, T. F., Jr., Adams, W. E., Bryant, J. E., and Carlton, L. M., Jr.: The Use of Whole-Blood Transfusions in Resections of the Lung. *J. Thorac. Surg.*, 1945, 14: 176.

Recent reports have cautioned against the use of massive blood transfusions in patients undergoing radical surgical procedures. The dangers in case of thoracic surgery seem to be two—citrate poisoning and pulmonary edema.

Dog experiments have shown that if from 0.25 to 0.30 gm. of sodium citrate per kilogram is given in less than fifteen minutes, fatal toxic reactions are apt to occur. If the administration time is lengthened or calcium ions are added, death does not occur. Under ordinary conditions a pint of preserved blood contains 2.5 gm. of sodium citrate. It would be necessary then to give a man weighing 50 kgm., 2,500 c.c. of blood in fifteen minutes or less to approximate the fatal dose of sodium citrate in animals. This transfusion rate is almost impossible in man, and any damage from the toxicity of the citrate could be prevented by the use of calcium.

Gibbon and his coworkers suggest that following extensive resection of the lung, when large infusions are given, pulmonary edema is likely to occur, and they presented 2 clinical cases in which an overloaded circulation probably resulted in pulmonary edema following lung surgery. The same group substantiated this clinical impression by a series of well controlled experiments on cats. This article presents similar observations on dogs.

The authors are interested in the use of massive blood transfusions and believe that the liberal use of blood to replace operative blood loss has made possible the radical surgical treatment of certain diseases such as carcinoma of the esophagus, in which the operations are long and attended by considerable blood loss. In thoracic surgery every cubic centimeter of blood loss should be replaced as quickly as possible by whole blood since shock due to hemorrhage is more easily prevented than treated.

Plasma, saline, and glucose infusions do not supply the desperately needed red cells and dilute the circulating blood that remains. The authors publish data on 14 lobectomies in which the average operative infusion of whole blood was 942.8 c.c. and on 5 pneumonectomies in which an average of 2,060 c.c. were given. These figures just about balance the measured blood loss for these operations as determined by White and Buxton. When these large amounts of blood were given in a short time very little saline and glucose were given in the next twenty-four hours. None of the patients developed any evidence of pulmonary edema or citrate poisoning.

Four groups of experiments were carried out. In the first, 8 dogs were subjected to left total pneumonectomy and upon completion of the operation they were transfused with 15 c.c. per kilogram of citrated whole blood (1 c.c. of 2½ per cent citrate as an anticoagulant for each 5 c.c. of blood). All of the dogs survived the pneumonectomy and transfusion (the infusion time varied from one to twenty-three minutes). Three dogs died within the first week, 1 of empyema and 2 of distemper. Autopsies were done from two to eighteen days following the operation and there was no clinical or anatomical evidence of pulmonary edema. The operative blood

loss averaged 20 c.c. and following operation the red count consistently was elevated 500,000 cells with a corresponding increase in hematocrit and hemoglobin.

In the second group, 8 dogs were subjected to lobectomy of the right lower and accessory lobes which was followed by a transfusion of 15 c.c. of citrated whole blood per kilogram of body weight. Approximately one month later the left lower lobe was resected and a similiar transfusion given. The staged lobectomy was well tolerated. One dog died five days after the second stage of extensive mediastinal and subcutaneous empyema. Two dogs died of distemper, and 1 died two days after operation of no determinable cause. Transfusions were given in from seven to twenty-six minutes and were not followed by pulmonary edema. A rise in blood counts similar to that in the first group was seen.

Twelve dogs (group 3) were submitted to lobectomy of the right lower, the accessory, and the left lower lobes at one sitting and then transfused with 30 c.c. per kilogram of citrated whole blood. Six of the dogs were transfused in ten minutes (in from seven to twelve minutes) and the other 6 in from three to six minutes. Of the seven-to-twelve-minute group, 4 died in from two days to two weeks of various causes, but none developed pulmonary edema. Microscopic sections showed congestion of the pulmonary vessels, but no edema. There was a marked rise in the blood counts, occasionally as much as 1,000,000 red blood cells. Five of the 6 dogs in the group which were transfused in from three to six minutes, developed pulmonary edema, and died in one or two days. At autopsy the trachea was full of bloody froth, and blood-tinged fluid escaped from the cut sections of the heavy, soggy red lungs. Microscopic sections revealed extensive edema fluid in the alveolar spaces.

In the fourth group, the operation and transfusion were carried out as in group 3 with the addition of bleeding. Six dogs were bled 25 c.c. per kilogram of body weight (50 c.c. less than the amount of the transfusion). The bleeding was carried out from the femoral artery while a transfusion was running into the femoral vein. The plan of this experiment was to avoid overtransfusion. The authors believed that the blood loss in bilateral lobectomy probably was about 50 c.c. Of the first 6 dogs (group A) 1 developed pulmonary edema and of group B, 2 dogs developed pulmonary edema. All transfusions were given in less than ten minutes. The authors believe that bleeding and transfusion here tended to simulate operative blood loss and replacement.

One must avoid applying data obtained from dog experimentation to human clinical practice. In addition to the basic physiological differences between dogs and human beings, certain conditions peculiar to this experiment must be considered. These factors must be kept in mind in interpreting the findings:

1. Blood loss in dog surgery is minimal compared to hemorrhage in similar operations on patients. All animals except those in group 4 were overtransfused.

2. These experiments are unusually rigorous. Clinically bilateral lung resection is done at staged operations at monthly intervals. The amounts of blood used here were not excessive but were given in a very short time.

3. The remaining lobes in dogs are normal, while frequently in clinical suppurative disease of the lung the upper lobes may contain residual disease.

4. We have no accurate measurement of the degree, if any, of edema that developed in the animals that survived.

Gibbon has shown that animals subjected to lung resection do not tolerate large transfusions as well as do normal animals. The authors believe that in addition to the amount of lung resected three other factors are present.

1. Obviously the amount of blood given will determine whether edema develops.

2. The time of transfusion is extremely important, at least experimentally. Clinically, this may not be important since blood is given considerably slower in most instances.

3. Overtransfusion tends to promote edema. If a transfusion, no matter how large, is given to replace hemorrhage in a reasonable period of time, or simultaneous with the hemorrhage, pulmonary edema will probably not occur except in the presence of severe cardiovascular or pulmonary disease.

When a patient sustains a severe hemorrhage in actual practice, blood may not be available for immediate replacement. Then large amounts of saline or glucose solution, or plasma are administered until blood is obtained; or if no intravenous therapy is given, extravascular tissue fluid enters the blood stream. Then a few hours later, blood is given in the amount of the hemorrhage and the circulatory system is overloaded, the heart may fail, and edema of the lungs occurs. It is not a matter of how much blood is given, because any fluid in sufficient amount will overload the heart. However, if large amounts of blood substitutes are given, one must necessarily limit the volume of blood given.

ROBERT R. BIGELOW, M.D.

SURGERY OF THE ABDOMEN

GASTROINTESTINAL TRACT

Rigler, L. G., Kaplan, H. S., and Fink, D. L.: Pernicious Anemia and Tumors of the Stomach. *J. Am. M. Ass.*, 1945, 128: 426.

Many efforts have been directed toward an early recognition of carcinoma of the stomach. Even with a vast expansion of methods of roentgen diagnosis, a more general use of gastroscopy, more extensive methods of examination of the gastric contents and stools, the sum total of results is discouraging. The salvage of but 2 per cent of the patients afflicted with this disease or even the survival of 6 per cent, the maximum reported, gives some idea of the difficulties involved.

The insidious onset of gastric carcinoma and the absence of striking symptoms even in advanced tumors are some of the difficulties to be surmounted in establishing the diagnosis. Roentgen examination is generally considered the most accurate procedure, yet the diagnosis of smaller tumors is frequently overlooked. In support of this view the authors cite a spot film of the stomach of a patient with pernicious anemia demonstrating a benign polyp 4 mm. in diameter. The lesion was not seen on first roentgen examination, but was found gastroscopically and then demonstrated on re-examination. In all probability many such lesions are missed.

In an effort to test the accuracy of the roentgen method in symptomless individuals it was deemed reasonable to examine a selected group of persons in whom the incidence would likely be higher than in a group of persons selected at random. The authors selected a group with pernicious anemias, since a review of the literature seemed to indicate that these patients would offer the most productive results. Accordingly, in 1939 they undertook the roentgenological examination of all patients with pernicious anemia at semiannual intervals.

The coexistence of pernicious anemia and carcinoma of the stomach has been studied extensively since it was first observed by Quincke in 1876. Numerous case reports have appeared as well as studies of clinical cases and a few autopsy series. The association of pernicious anemia with carcinoma seems to be a well established fact, but there is a difference of opinion as to its frequency. An increase in the coexistence of the two diseases is evident and is best illustrated by the various reports from the Mayo Clinic during the last twenty years. This trend may be due in part to the better recognition of gastric tumors, but may also be due to the increased longevity of patients with pernicious anemia, resulting from the institution of liver therapy. In all the case reports there is a vast preponderance of individuals in whom gastric tumors are discovered either some time after (as long as seventeen years) or simultaneously with the discovery of the pernicious anemia. The data presented in a large number of studies indicate clearly that an etiological rather than an accidental relationship exists between pernicious anemia and tumors of the stomach. Most investigators have concluded that there is a common precursor of the two diseases. Numerous other studies point to a hereditary or familial deficiency which predisposes to both diseases.

Another phase of the problem deserves special attention, namely, the relationship of benign polyps of the stomach to pernicious anemia and also to carcinoma of the stomach. Various investigators have found that benign polyps are even more frequent than carcinoma in patients with pernicious anemia. Little doubt exists that many benign epithelial tumors of the stomach may develop into cancer. Therefore, the discovery of a polyp of the stomach has great significance. Any effort to effect a reduction in the number of cases of carcinoma of the stomach must give due consideration to the radical treatment of these polyps. The possibility of the malignant degeneration of a polyp must be particularly borne in mind in cases of pernicious anemia because of the tendency of the latter to develop carcinoma.

The present report contains a roentgen study of 211 patients with pernicious anemia. Roentgen examinations of the stomach with a barium meal were made. In approximately 20 per cent only one examination was made, usually at the time the anemia was discovered. In the remaining 80 per cent multiple examinations were made, usually semiannually. Painstaking efforts were made to reveal not only carcinoma but also benign polyps.

The authenticity of the diagnosis of pernicious anemia was established in these cases by blood smears, bone marrow studies, the presence of glossitis, the findings of subacute combined sclerosis, an achlorhydria after histamine, and by the clinical and hematological response to liver therapy. Gastroscopic examination was made in many of these patients and in all of them the gastric contents and stools were carefully studied. Almost all of the reports of carcinoma were confirmed by surgery or by autopsy. Many of the benign tumor cases were likewise confirmed. The results of the study showed that carcinoma was found in 8 per cent (17 patients) and benign polyps in 7.1 per cent (15 patients) of the cases.

In an autopsy study reported elsewhere by the authors, 12.3 per cent of the patients with pernicious anemia were found also to have carcinoma of the stomach.

Outstanding features which characterize the findings in this series are: (1) the rapid change from a benign polyp to a cancer, (2) the presence side by side of both benign and malignant tumors, (3) the absence of symptoms in the presence of large tumors, and (4) the development from a small,

barely detectable lesion to an extensive inoperable carcinoma.

1. The rapid change from a benign polyp to a malignant tumor is well illustrated in a patient with a progression from pernicious anemia through gastric polyps to a full-blown gastric carcinoma.

2. In a number of cases sections from two portions of the same gastric polyp, removed surgically from a patient with pernicious anemia, showed a typical benign papilloma in one portion and a typical invasive carcinoma in the other.

3. The salvage of cases of gastric cancer without symptoms by surgery, after discovery of the tumor by routine procedure in patients with pernicious anemia has been strikingly illustrated in a number of instances and is a gratifying result of this study. The authors introduce an interesting case history in which the patient had no gastric symptoms whatever. Further questioning after the discovery of the x-ray findings elicited no complaints referable to the stomach. This is characteristic of patients with benign polyps, and the lesions found were certainly benign in origin, although malignant degeneration had already occurred. This case strikingly demonstrated the usual sequence, namely, atrophy of the gastric mucous membrane with pernicious anemia, benign polyp, and adenocarcinoma.

4. The development from a small, barely detectable lesion to an extensive inoperable carcinoma was illustrated by a case which showed the unfortunate outcome which attends the failure to repeat routine examinations. When first examined the findings were not sufficiently definite to justify surgery and unfortunately this patient did not return for re-examination semiannually. When re-examined roentgenologically as a routine procedure two years later the patient presented an extensive polypoid carcinoma of the stomach. Surgery was undertaken but extensive metastases were found. The tumor was of the bulky type and measured 10 cm. in length. At no time was the gastric distress anything more than minimal. Had re-examinations been made at six month intervals, this tumor would in all likelihood have been discovered eighteen months earlier at which time surgery might well have been successful.

The lack of symptoms was outstanding in the entire group of patients. The authors refer to 1 instance in which a patient looked the picture of health, and the hemoglobin was 90 per cent with a normal red-blood-cell count, and yet a lesion with extensive metastases was found. The diagnosis was arrived at by means of the roentgenogram which demonstrated the tumors.

It would appear from this study that routine semiannual roentgen examination of the stomach in patients with pernicious anemia is a highly productive procedure. It does not, however, penetrate very deeply into the problem of early detection of carcinoma of the stomach in other cases, since, at most, 5 per cent of the patients who develop cancer of the stomach will have pernicious anemia. The authors indicate that the results obtained in this study point the way toward a more general utilization of the roentgen examination of the stomach in larger groups of individuals who might be likely to develop carcinoma. If, for instance, all individuals with achlorhydria were examined routinely, and repeatedly, it might be possible to obtain a larger salvage.

MATHIAS J. SEIFERT, M.D.

Lannin, B. G.: Experimental Evaluation of a Satisfactory Operation for Ulcer. *Surgery*, 1945, 17: 712.

Studies on the effectiveness of various types of operative procedures in preventing the development of ulcer in experimental animals subjected to implantations of histamine-beeswax mixture were made. Experimental ulcer may be produced by a variety of methods but the majority of them invoke alteration of the normal anatomy and physiology of the animal. An extensive review of the literature on the experimental production of ulcer indicates that Code's method of implanting histamine-beeswax provides the best means of producing typical chronic duodenal and gastric ulcer consistently in intact animals. Further, the preponderance of evidence suggests that the most important single factor in the causation of ulcer is an excess of unneutralized gastric acid. The primary requisite of a satisfactory operation for ulcer, therefore, is effectual reduction of the gastric acidity. By employing Code's method for producing ulcer, the author could evaluate the protective influence of twelve operative procedures commonly used in the surgery of ulcer. An attempt is made to correlate the experimental findings with clinical data already available. The experimental results are presented in groups in accordance with the type of operative procedure employed.

Group 1. Gastrojejunostomy was performed on 4 dogs. Later they were given the histamine-beeswax implantations. Ulcer developed in all of these animals, and 2 dogs died from peritonitis due to perforation of large jejunal ulcers. Thus, it is apparent that this operation offers no protection against the development of ulcer but, on the contrary, appears to expedite its occurrence.

Group 2. Gastric resection or antral excision. This operation consisted of resection of the antral segment of the stomach, which comprises 25 to 30 per cent of the total area. Continuity was then established by gastrojejunostomy of the Billroth II type. Ulcer developed in all animals. This operation fails to reduce the gastric acidity adequately and must be considered unsatisfactory. Clinical evidence confirms these findings.

Group 3. Extensive gastric resection which controls the gastric acidity and insures against recurrent ulcer and yet leaves the residual pouch large enough to provide adequate gastric capacity would appear to be a satisfactory operation. Such a procedure was tested with resection of the distal 75 per cent of the stomach, followed by anastomosis with the first portion of the jejunum and inversion of the lesser curvature, according to the Hofmeister pattern. The

operation completely protected the dogs against the development of experimentally induced ulcer. It is clearly indicated by clinical and the experimental evidence that a short afferent loop contributes to the protection provided by this operation. Thus, extensive three-quarter resection with a short loop anastomosis would appear to be the most satisfactory procedure.

Group 4a. The Finsterer antral exclusion with excision of the antral mucosa was found to be as acceptable as the three-quarter resection. This procedure is of value in dealing with so-called inoperable duodenal ulcer and varies from the extensive resection only in the technique of managing the distal stump.

Group 4. The Finsterer antral exclusion without excision of the antral mucosa protected 4 dogs against ulcer, but erosions in the gastric pouch were more numerous than following Group 3 and 4a operations. Although the experimental evidence is not conclusive, clinical evidence indicates that this procedure should be abandoned in favor of the Group 3 and 4a operations.

Group 5. Antral resection plus total intragastric regurgitation, the Schmilinsky procedure, was found to enhance rather than to protect against the development of jejunal ulcer and is to be condemned.

Group 6. Fundusectomy with gastrojejunostomy appeared to furnish satisfactory protection against the development of jejunal ulcer in dogs. Clinically, however, the gastric capacity is less adequate than that following the Group 3 or 4a procedure, since the most dilatable portion of the stomach is removed.

Group 7. The operation in this series approximated Connell's original procedure and was done on 4 dogs. This procedure offers less protection than the preceding one, since 1 of the dogs developed duodenal ulceration and the others developed marked erosions and gastritis. None of 5 patients upon whom this operation was done became achlorhydric, and symptoms from the ulcer continued in 2 of them. The principle of fundusectomy cannot compete favorably with the Group 3 or 4a procedure, and the clinical indications for such an operation would be much more limited.

Group 8. Hemigastrectomy. It appears that this operation does not furnish adequate protection. An occasional ulcer which might develop following this procedure outweighs the impairment of gastric function which might follow the more extensive resection.

Groups 9 and 10. Devine exclusion and modified Devine exclusion with total intragastric regurgitation. These procedures proved unsatisfactory and are to be condemned.

Group 11. Sleeve resection or segmental gastrectomy. Although the experimental evidence is not conclusive, the clinical limitations of such an operative procedure are obvious.

A number of requirements which a satisfactory operation must fulfill are apparent. An effective reduction of gastric secretion must be accomplished—this necessitates the sacrifice of an extensive segment of gastric tissue, including the antrum and lesser curvature. The manner of duodenal inversion, with or without removal of the ulcer, is of no great consequence, but all the antral mucosa must be removed. Although the experimental evidence favoring the Edkin's hypothesis is not conclusive, clinical experience indicates clearly the importance of the antral mucosa. The anastomosis with the jejunum must be made so that the afferent loop is as short as possible. The short proximal loop is indicated by clinical evidence, and by the possibility of the secretin factor and decreased tissue resistance to ulceration with a long loop. Extensive three-quarter resection, including the antrum, or at least the antral mucosa, and anastomosis with a short proximal afferent loop has been done clinically in 300 patients without a single instance of recurrent jejunal ulcer.

JOHN L. LINDQUIST, M.D.

De Azevedo Sodré, J. P.: Treatment of Perforated Peptic Ulcers by Secondary Gastrectomy (Tratamento das úlceras pépticas perfuradas pela gastrectomia secundária). *Rev. brasil. cir.*, 1944, 13: 15.

In the emergency hospital in which the author is chief of the surgical service, 50 cases of perforated ulcer of the stomach or duodenum were seen from August, 1938, to August, 1944. In these cases, in all of which the ulcer had perforated into the peritoneal cavity, a linear or purse-string suture was made in two planes and covered with a fragment taken from the end of the omentum. A pedicled omentoplasty was not performed in order not to fix the omentum in the upper part of the abdomen, as free mobility is necessary to its normal functioning. In only 1 case gastroenteroanastomosis was performed. In 4 cases a mistaken diagnosis of appendicitis was made. Only 1 case was drained. Forty of these patients recovered and 10 died, a mortality of 20 per cent, which compares favorably with mortality statistics quoted from the foreign literature. Brief histories are given of the 10 cases in which death occurred.

Among these 40 patients with perforation that survived, 13 returned later with severe symptoms of ulcer. Evidently the suture had saved their lives but had not put a stop to the progress of the ulcer. Although clinical diagnosis of perforated ulcer is not difficult, roentgen examination was made systematically and showed pneumoperitoneum. The perforation did not recur in any of these cases but cases of recurrent perforation have been reported. Of the 13 patients that returned 10 were operated on by gastrectomy and 2 by gastroenteroanastomosis; 1 patient was given medical treatment. The technique of the gastrectomy is described and histories are given of the 13 cases. Roentgenograms, photographs of the operative specimens, and photomicrographs of the histological findings are also given.

The author concludes that resection of the stomach is indicated in the treatment of perforated pep-

tic ulcer in the hands of skilled surgeons. The roentenograms show functional readaptation of the stomach after gastrectomy.

AUDREY G. MORGAN, M.D.

Fraser, K.: Malignant Tumors of the Small Intestine. *Brit. J. Surg.*, 1945, 32: 479.

The author reviewed the statistics of the Western Infirmary, Glasgow, for the ten years from 1933 to 1942. During this decade 13 cases of small-bowel malignancy were found either at operation or autopsy. During the same period there were 22,975 operations on the gastrointestinal tract (including the biliary system), and the total hospital autopsies numbered 2,674. These 13 accepted cases were all proved histologically or found at autopsy; 6 were carcinoma and 7 were sarcoma. Malignancy at the ampulla of Vater was not included because of the difficulty of proving a true intestinal origin for these cases. Further, no case was included in which malignancy elsewhere in the intestines was also present. To these 13 cases are added 8 others from various sources, making a total of 21 cases; 12 were carcinoma and 9 sarcoma. In 7 cases the tumor was located in the jejunum, in 13 cases in the ileum, and in 1 the location was not stated.

Several authors have suggested theories as to why malignancy is so much less frequent in the small intestine than elsewhere in the intestinal tract, and all seem to be agreed that this is due to the fluid nature of the contents, its alkalinity, and the absence of abrupt bends and stasis so typical of the colon.

In many of the cases the onset of symptoms is gradual and may last months and even years as a somewhat vague story of weakness and easy fatigue, with progressive loss of weight, sometimes amounting to 28 or 30 pounds. In a large number of cases anemia is a marked feature. Abdominal symptoms and signs appear later. In some cases the site and character of the tumor influence the type of symptoms produced: thus a high tumor may give earlier gastric upset with nausea and pain occurring at variable times after meals and accompanied by atonic dyspepsia. In more distally situated growths gastric symptoms may be more fleeting and therefore less noted. Changes in bowel habit are common, usually in the form of an increasing constipation, although not infrequently alternating constipation and diarrhea are observed. Once gastrointestinal symptoms are established they usually take the form of recurring attacks of intestinal obstruction with sudden severe cramps in the central and lower abdomen, accompanied by nausea and vomiting and a feeling of abdominal distention with borborygmi. Some cases are first seen as cases of intestinal obstruction, which, if acute, will show the usual picture of vomiting, cramplike pains, abdominal distention, and visible peristalsis. A few are first seen as perforations—2 cases, or possibly 3, in this series were such.

X-rays have a very definite place as an aid to diagnosis of malignant small-bowel tumors. In any case of persistent unexplained melena in which x-ray investigation of the stomach and colon shows no abnormality, and provided there is no acute intestinal obstruction, a full x-ray investigation of the small intestinal tract is indicated.

The common type of carcinoma found is of the constricting ring variety, similar to that type so frequently found in the distal half of the colon and presenting the histological picture of a columnar-celled adenocarcinoma. An occasional complication of the annular type of tumor is the occurrence of intussusception.

Sarcoma of the small intestine may be annular and constrictive, polypoidal, or tubular. The obstructive effect of the annular growths may be made more complete by pressure of adjacent and involved lymph glands. The tubular type of growth may also cause acute intestinal obstruction. Perforation of the tumor or the adjacent wall occurs rarely.

The treatment of choice is resection of the affected loop of bowel along with a wedge of related mesentery and contained lymphatics. The continuity of bowel is re-established either by an end-to-end or a lateral anastomosis. Postoperative or palliative x-ray therapy is recommended by many.

In the author's series of 21 cases, 15 operations were performed: in 13 a resection and anastomosis was carried out; in 1 case a two-stage procedure was done, first a lateral anastomosis to short-circuit the tumor, followed fourteen days later by resection of the tumor; the other operation consisted of simple drainage of a pelvic abscess. Of the 15 patients 9 died within fourteen days, giving an operative mortality of 60 per cent; 2 of them, possibly 3, had perforations before admission to the hospital. For the 10 cases of carcinoma submitted to operation the operative mortality was 50 per cent and for those of sarcoma it was 75 per cent.

The prognosis is bad; the immediate because of the degree of obstruction present when the patient is first seen by the surgeon, and the late because of the high frequency of metastasis.

JOSEPH K. NARAT, M.D.

Crymble, P. T.: Ulcer of the Second Part of the Duodenum. *Brit. J. Surg.*, 1945, 32: 500.

The author reports 4 cases of an ulcer in the second part of the duodenum, and draws the conclusion that when a patient has duodenal symptoms but the first part of his duodenum is normal on x-ray examination and on surgical exploration, the palpation of the second part of the duodenum should not be neglected.

In the first case the x-ray examination revealed an hourglass contraction with a small medially placed diverticulum of the second part of the duodenum. At operation a palpable lump was found in the wall of the second part of the duodenum near its upper end and corresponding to the hourglass contraction seen in the roentgenogram. Posterior gastroenterostomy was performed.

An opaque meal in the second case showed a hyperperistaltic but otherwise normal stomach, and com-

plete absence of any duodenal shadow. At operation no gastric nor duodenal ulcer was found. The second operation, performed two years later, showed a palpable thickening in the anterior wall of the upper part of the pars descendens duodeni. The gastrocolic ligament was adherent to the ulcer area. A posterior gastroenterostomy was performed and convalescence was uneventful.

In the third case an opaque meal showed a very large, ptosed, atonic stomach with a complete six-hour gastric retention. At operation the stomach was large, atonic, and showed no obstruction at the pylorus. There was a hard lump in the second part of the duodenum about the size of a walnut. Posterior gastroenterostomy was performed.

In the last case there was no gastric retention despite the presence of a palpable lump at operation.

For many years one was accustomed, when duodenal ulcer was suspected, to limit the examination to the first part; but cases such as reported by the author show that it is also necessary to palpate the deeply situated upper half, or second part of the duodenum. Only the palpable ulcer can be recognized, but this is the one which is suitable for operation.

JOSEPH K. NARAT, M.D.

Graham, R. R., and Tovee, E. B.: The Treatment of Perforated Duodenal Ulcers. *Surgery*, 1945, 17: 704.

This communication deals with the treatment of 114 cases of perforated ulcer. The study is limited to the consideration of perforated duodenal ulcers because the number of perforated gastric ulcers is relatively small; and since a considerable number of them are malignant, their inclusion would complicate the problem. The authors' discussion of treatment is confined to management of the emergency created by the perforation, and the subsequent fate of the patient will be studied further. All but 3 of the 114 patients in this series were submitted to operation. There were 7 operative deaths, a mortality of 6.3 per cent.

In presenting the problems of treatment, the authors ask several questions, their first one being: "Why is the patient with acute perforation of a duodenal ulcer sick?" Bacteriological studies of the peritoneal exudates of these patients indicated that bacterial peritonitis was not the factor responsible for their illness. In this group of 114 patients, in which there were 7 operative deaths, there were only 3 in whom the peritoneal infection was a contributing factor to the fatality.

The authors conclude that the seriousness of the emergency is in direct ratio to: (1) the degree and duration of pain, (2) the extent of biochemical imbalance, and (3) the degree of nutritional disturbance present. For these reasons they believe in the wisdom of correcting the nutritional disturbance and biochemical imbalance before operation is undertaken. This has taken as long as twelve hours after the patient's admission to the hospital, and such a delay has never proved to be disastrous.

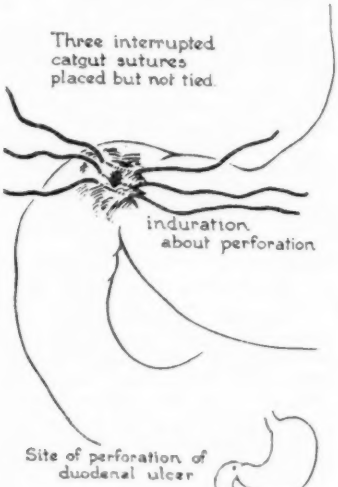
Three interrupted catgut sutures placed but not tied.
induration about perforation
Site of perforation of duodenal ulcer

Fig. 1.

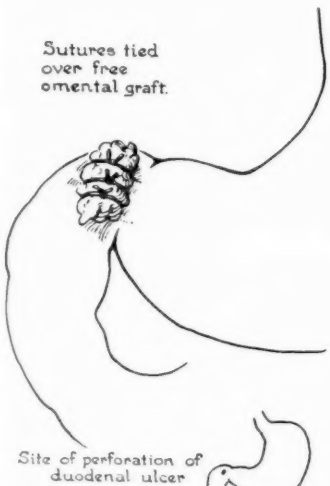

Fig. 2.

Fig. 1. The placing of sutures in relation to the perforation.
Fig. 2. Sutures tied over the free omental graft. No attempt is made to close the perforation by the sutures. They are tied only sufficiently tight to hold the graft in situ.

In order to undertake the operative procedure adequately and intelligently, 3 further questions must be answered: (1) Why is an emergency operation ever necessary in gastrointestinal disease? (2) What is the surgeon's responsibility in an emergency operation on the gastrointestinal tract? (3) Upon what do we depend for the closure of gastrointestinal perforation?

In answer to the first question, it is obvious that an emergency operation is done solely because we believe that without operation the patient would die. In answer to the second, the surgeon's responsibility in an emergency operation is solely to save life, and to do that with the most simple, minimal surgical procedure which will accomplish this end. In answer to the third, all gastrointestinal perforations are closed by the formation of fibrin.

Accepting the tenet that the surgeon has no responsibility except to save life, we are spared any debate as to whether he should do a concomitant gastrojejunostomy, pyloroplasty, or gastric resection. None of these procedures is necessary to save the patient's life. There is no responsibility at this time either to prevent the development of pyloric obstruction or to cure the patient of his duodenal ulcer. Realizing that fibrin is responsible for the closure of all perforations in the gastrointestinal tract, we guide fibrin to the perforation in the most simple manner possible.

The authors' method of guiding fibrin to the perforation is illustrated in figures 1 and 2. Three interrupted catgut sutures are spaced over the perforation parallel to the long axis of the duodenum and a piece of omentum, either attached or detached, is laid across the area and tied in place. The sutures are tied just sufficiently tight to hold the omentum in position and no attempt is made to close the perforation itself. Fibrin forms in this area and seals the closure. Gross peritoneal exudate is aspirated and the abdominal wound is closed without drainage. Sulfonamide drugs were left in the peritoneal cavity in only 3 cases and are not considered necessary. The authors condemn all procedures save simple closure in the operation for acute perforation. JOHN L. LINDQUIST, M.D.

Gray, H. K., and Sharpe, W. S.: The Problem of Massive Hemorrhage from Duodenal Ulcers of Patients Beyond Middle Life. *Ann. Surg.*, 1945, 121: 840.

Ample evidence has been accumulated to emphasize the necessity of resecting the pyloric sphincter and antrum whenever possible in the course of a high gastric resection for duodenal ulcer. There are, however, many instances in which surgical discretion forbids such an ideal procedure: (1) when the duodenal lesion is the site of active inflammation and is surrounded with indurated and edematous tissue, (2) when the patient himself is in no condition to undergo an extensive resection, or (3) when both reasons exist. The surgeon then must exercise judgment and perform that operation which seems indicated.

The Devine exclusion operation would seem to have only a limited place in the repertory of treatment for duodenal ulcer. Of a group of 62 patients of all ages for whom the operation was done, 52 could be traced by the authors. Forty per cent of the traced patients were known to have had recurrence of their trouble. However, if the operation is to be done at all, it would seem indicated only for that small and select group of elderly patients who have bleeding, nonobstructing duodenal lesions and who for various reasons are in poor condition for any type of surgical treatment. Seventeen patients aged fifty years or more were found to be included in this group of 62. One of these patients died seven days after the operation (6 per cent). Of the remaining 16, only 3 (14 per cent) were included in the group of 21 who had recurrence of their trouble. One of these 3 has since become well. Thirteen were part of the group of 31 (42 per cent) who obtained good results from the operation. While only 31 (60 per cent) of the 52 patients of all ages whom the authors succeeded in tracing obtained good results, 13 (81 per cent) of the 16 elderly patients have not had any further trouble. Their survival is a good argument for the operation.

Jameson, E. M., and Hoey, W. O.: Postoperative Physiological Changes in Regional Ileitis. *Ann. J. Surg.*, 1945, 68: 369.

In 2 cases of regional ileitis the terminal ileum, cecum, ascending colon, and half of the transverse colon were immobilized and resected. Gastrointestinal continuity was re-established by means of a Lahey-Mikulicz type of ileocolostomy which was subsequently closed. Both of the patients had a postoperative complication which was explained as being secondary to extracellular dehydration. In each instance there was an increase in hematocrit and serum protein but a decrease in blood chloride. The hemoconcentration was caused by an extensive loss of sodium and chloride ions. When the loss of these electrolytes through intestinal drainage exceeded the supply, the extracellular spaces were called upon to furnish the difference. In order to maintain the proper concentration of the remaining electrolytes the fluid volume of the blood was reduced and hemoconcentration followed. When the volume of the circulating blood reaches a critical level there may be a sudden circulatory collapse and a typical picture of shock follows. This picture may occur suddenly.

This condition was dramatically controlled by a rapid infusion of large quantities of plasma and normal saline solution given simultaneously. A constant check of the water and electrolyte balance by laboratory methods is necessary to anticipate and control these variations before the critical level is reached. SAMUEL J. FOGELSON, M.D.

Cutler, G. D., Stark, R. B., and Scott, H. W., Jr.: Lymphosarcoma of the Bowel in Childhood. *N. England J. M.*, 1945, 232: 665.

Primary neoplasms of the intestine are extremely rare in childhood as compared with those in adult

life. Except for adenomatous polyps, most intestinal tumors in early life are sarcomatous. Lymphosarcoma is one of the more frequent types of this group. Four cases of lymphosarcoma and 1 case of reticulum-cell sarcoma of the intestine treated at the Children's Hospital, Boston, during the last fifteen years are reported.

Lymphosarcomas may remain temporarily localized to the intestinal tract but ultimately they invade and metastasize as malignant neoplasms. These tumors arise in the lymphoid follicles of the submucosal layer of the bowel and infiltrate the other layers, although tending to remain intramural and to extend through mucosa and serosa only as a relatively late change. Therefore, large fungating masses completely enveloping the bowel may develop before intestinal obstruction is caused. Yellowish-white, subserosal, plaquelike tumors, frequently umbilicated and frequently multiple, represent a relatively early stage of the process. Subserosal extension may cause diffuse thickening and dilatation of a segment of the bowel.

The patients were all males. The ages of the patients varied from four months to seven years.

The symptoms were those of any intestinal tumor causing obstruction—abdominal pain, anorexia, and constipation being most frequent, and occasionally associated with fatigue and irritability. On examination, an abdominal mass was noted in 3 cases, which at operation proved to be an intussuscepted tumor in 2 cases. The frequency of intussusception is notable, for it occurred in 3 of the 5 patients. The youngest patient in the group, a four-month-old baby, had the symptoms of intussusception and at operation was found to have intussusception of the ileoileal type caused by 2 small lymphosarcomas of the terminal ileum. Two older patients, six years of age, had increasing constipation for four and three months, respectively, which led to fecal impaction. One of these patients developed acute intestinal obstruction a few days after hospitalization, and by means of a barium enema was found to have an ileocolic intussusception associated with a large tumor of the terminal ileum. The other patient had a chronic intussusception resulting from lymphosarcoma of the cecum and ascending colon. In the fourth patient, seven years of age, vague abdominal complaints led to examination which revealed a large hard mass filling most of the right side of the abdomen. Blood in the stool was the complaint in the last patient, twenty-six months of age, who had a reticulum-cell sarcoma of the rectosigmoid.

Examination of the blood revealed no abnormality in any of the 5 patients at the time of admission. Terminally, however, 2 of them developed the blood picture of lymphoblastic leucemia.

The operative procedures and course in the 5 patients were as follows:

In the four-month-old infant the ileoileal intussusception was reduced, the segment of ileum containing the two small lymphosarcomas was excised, and a lateral anastomosis was performed. Twenty-eight days after operation the infant developed the picture of acute lymphoblastic leucemia and died.

A Mikulicz resection of the terminal ileum containing a large tumor was performed in the second patient with an intussusception. The tumor extended to the sigmoid and root of the mesentery and smaller tumors were noted in the proximal ileum and jejunum. Recurrent intestinal obstruction necessitated a second laparotomy. Roentgen-ray therapy (1,350 roentgens) was given. During the fourth week lymphoblasts appeared in the blood smears, and masses of tumor were noted in the abdomen. The child died on the thirty-ninth postoperative day. Autopsy revealed generalized metastases.

The chronic colocolic intussusception was irreducible. There were many large, yellow nodules in the omentum, and one was removed for biopsy. An ileotransverse colostomy was performed. Roentgen-ray therapy (600 roentgens) was given. The child died nine weeks after operation.

In the fourth case a large tumor of the cecum and ascending colon was considered to be inoperable because of its extent and the presence of enlarged hard mesenteric lymph nodes. A biopsy of the tumor was performed. Death occurred on the sixteenth postoperative day.

An abdominoperineal resection of the rectum and lower sigmoid was performed in the last case. Several large nodes in the mesosigmoid were excised. The tumor (reticulum-cell sarcoma) lay in the wall of the rectosigmoid. A total of 3,000 roentgens was given and the patient was discharged sixty days after operation. The child has remained well for fifteen months, and is the only survival in the group.

In the authors' opinion a combination of radical surgical extirpation of the involved intestine and mesentery followed by heavy roentgen-ray therapy to the abdominal and mediastinal drainage areas offers the patient the optimal chance of suvival, if, indeed, any such chance may be called optimal in this highly fatal disease.

ERNEST E. ARNHEIM, M.D.

Behrend, M.: Colon Surgery. *J. Am. M. Ass.*, 1945, 128: 9.

The use of sulfonamides reduced the number of cases of peritonitis and infection in operations on the colon. Good results were formerly obtained as a result of the proper preparation of patients for at least a week prior to operation. With a primary purge and a liquid diet, the contents of the bowel were greatly reduced. In addition, parenteral fluids and blood transfusions were given.

The best results were obtained, however, when succinylsulfathiazole was used. This drug can be given in large doses, without toxic effects. It reduces the number of coliform bacteria per gram of wet stool from 10,000,000 to 100. Through its use, the several-stage Mikulicz operation can be reduced to a single procedure.

Succinylsulfathiazole should be given in doses of 0.25 gm. per kilogram of body weight, for at last a

week before operation. Colonic irrigations are not necessary because the drug has the property of diminishing the contents of the intestinal tract, rendering it practically empty. The administration of succinylsulfathiazole makes the use of various aseptic procedures unnecessary in colon-to-colon anastomosis. SAMUEL KAHN, M.D.

Penick, R. M., Jr.: Surgical Treatment of Congenital Megacolon. *J. Am. M. Ass.*, 1945, 128: 423.

Congenital megacolon is an uncommon, little understood condition, which has challenged the medical profession since Hirschsprung's report. Little is known of the etiology of this disease, hence any plan of treatment becomes at once vulnerable to adverse criticism. Nevertheless, some plan of management is desirable and may prove useful even though it is necessarily tentative. The literature on the subject is confusing and difficult to evaluate. Many articles consist of isolated case reports, describing treatment but they show follow-ups of only a few months.

In the present article the author attempts to correlate his experience in the management of cases of congenital megacolon with the results of treatment of this disease in the hands of others. No reports of single cases have been included. The results in 11 patients on whom left lumbar sympathectomy was performed by the surgical staff at Tulane University School of Medicine and the Ochsner Clinic have been compared with results following this and other types of therapy previously reported.

In conjunction with this study a careful survey of the records of two large general hospitals in New Orleans was made covering the period of the past ten years. All cases in which a diagnosis of megacolon or questionable megacolon appeared were carefully reviewed. About 30 such cases were found. In most instances the diagnosis was not established, although there was frequently roentgenographic evidence of colonic dilatation and the clinical findings were often confirmatory. Usually a few days of conservative treatment in the hospital sufficed. The subsequent course of these patients is not known. It is significant, however, that there were only one or two readmissions to either hospital for a similar complaint. From this the author infers that mild forms of the disease exist which require special treatment only when unusual impaction occurs.

The condition of the 11 patients treated by sympathectomy, however, definitely supported a diagnosis of congenital megacolon in its severe form. No operation was performed if any doubt as to the nature of the disease existed or if it seemed feasible that medical management would prove satisfactory.

Variation both as to symptomatology and as to the condition of the intestine is met with in the severe forms of megacolon. This was evident in the 11 patients treated by the author. In 10 of these pronounced dilatation of the sigmoid with involvement of varying amounts of the remaining colon was found. In the eleventh case no demonstrable abnormality of the descending colon, sigmoid, or rectum was noted over a period of four years. Roentgenographic studies showed the undilated colon to have a normal ability to expel material from its lumen. The remainder of this patient's colon was affected. Massive dilatation of the terminal ileum developed later. Many writers confirm these variations regarding the site and extent of involvement. These varied clinical types of megacolon, no doubt, have caused considerable confusion in evaluating methods of treatment.

The diagnosis must be carefully established by adequate observation and study of the patient. Medical management, utilizing the sympathetic stimulants, is recommended for a trial of from eight to ten weeks. Results with mecholyl bromide, administered orally, have been promising. Beneficial effects have likewise been reported with the use of syntropan, an atropinelike drug which acts as a parasympathetic paralyzant. Both of these compounds have opposite effects. Since both give good results this would seem to support the often-expressed contention that a perversion of the autonomic system is the fundamental fault.

Drug therapy must be accompanied by a careful regimen to aid bowel function, particularly in the first few months of treatment. A therapeutic test with acetylcholine or a spinal anesthetic should be carried out in each case. There is every indication that therapeutic tests are extremely valuable. Spinal anesthesia is definitely known to have beneficial effects which often persist for some time. Anesthesia obtained in this manner usually results in a large bowel evacuation, sometimes several such evacuations, within the following twenty-four hours. This result would indicate that expulsive power exists and is therefore regarded as a good reaction, particularly if sympathectomy is considered. While the present status of information does not warrant a dogmatic opinion, the failure of spinal anesthesia to effect spontaneous evacuation is probably closely associated with failures in surgical intervention. De Takats, who has made an exhaustive study of cases of congenital megacolon, is of the opinion that an atrophied bowel wall is present and that preoperative studies should determine this factor. He advocates the use of a barium enema followed by the injection of a spinal anesthetic or acetylcholine bromide. Forty-five minutes later a film should be made to determine the extent of the evacuation. De Takats believes that the use of the drug is easier and safer than a spinal anesthetic, especially for debilitated infants. The author believes it inadvisable to subject a patient less than two and one-half years of age to any surgical procedure unless it is a life-saving measure. Conservative management, even though not entirely satisfactory, is the treatment of choice in infants.

If the medical regimen does not prove satisfactory and the age of three has been reached, left lumbar sympathectomy should be considered, especially if spinal anesthesia produces a copious bowel evacuation. Left lumbar sympathectomy is the simplest

operative procedure that is justifiable. In patients over three years of age the mortality is practically nil and the results are as good as with any operative method, except possibly the more extensive sympathetic ablations.

Left lumbar sympathectomy brings a relief which compares favorably with results obtained by more extensive operations. In the author's series of 11 patients, all were treated in this manner and in 7 the effects were highly satisfactory. Three of the other patients were greatly benefited but required occasional cathartics or enemas. One case was a complete failure, but this result was not unexpected, since the patient had involvement of both the colon and the ileum, and a spinal anesthetic had had little effect preoperatively. A follow-up study was made on 9 of the patients for from one to eleven years. The other 2 were not followed up for as long a period, because in the case of 1 the treatment was a complete failure and the other child died from nephritis three months following the operation after apparently having been entirely well during this three-month period. The author's report shows that 90 per cent of the patients were greatly benefited. There were no deaths from the operation, although the patients' ages ranged from eighteen months to fifty-two years. Roentgenographic examinations made at various intervals postoperatively indicated that while the bowel did not become normal, there was less dilatation and retention than at the time of the original studies.

Results of lumbar sympathectomy reported in the literature indicate that satisfactory function is obtained in the great majority of patients. Consequently it would seem to be the procedure of choice when medical treatment has been ineffective. Should lumbar sympathectomy fail, it becomes necessary to decide whether the right lumbar chain or the right splanchnics should be removed. These operations can be done in stages.

Failure to gain any improvement after left lumbar ganglionectomy might be considered as evidence that further sympathetic surgical measures are contraindicated, but some improvement would warrant bilateral operation. If bilateral ganglionectomy fails to show improvement, one certainly hesitates to do more. Resection of the intestine is a hazardous operation which has been advocated by many surgeons. The author believes that intestinal resection should be resorted to only after medical management and sympathetic surgical measures have failed entirely. Removal of the intestine gives best results in older patients and in those with involvement of small amounts of intestine.

MATHIAS J. SEIFERT, M.D.

Scott, H. W., Jr., and Ware, P. F.: Acute Appendicitis in Childhood. *Arch. Surg.*, 1945, 50: 258.

During the five-and-a-half-year period from January 1, 1939 to June 30, 1945, there have been 506 children with acute appendicitis treated in The Children's Hospital, Boston. Fifty-nine per cent of the patients were male and 41 per cent were female.

Examination of the relation between the type of appendicitis and age of the patients serves to support the view that perforation of the acutely inflamed appendix tends to occur earlier in the course of the disease in babies and young children than in persons in later life. In children under six years of age, perforation was encountered more than twice as often as simple acute appendicitis without rupture.

It has long been believed that infections of the upper respiratory tract bear a definite relation to appendicitis, and that the latter has its greatest incidence during the so-called "respiratory seasons." However, there was no striking seasonal variation in the incidence of appendicitis in this five-and-a-half-year period. By and large, in this series acute appendicitis developed rather suddenly in children who had been well previously.

In 66 per cent of specimens exhibiting perforation, fecaliths were present. Another factor which may predispose to the development of acute appendicitis in children is infection of the appendix with pinworms (oxyuris vermicularis). These parasites were present in the appendixes of 60 patients presenting the clinical picture of acute appendicitis.

In a child the appendix is usually longer in relation to the size of the peritoneal cavity and the cecum is frequently more mobile than in an adult. These two factors permit more widespread peritoneal contamination at the time of perforation. In addition, the omentum is frequently so short, so devoid of fat and so underdeveloped in early life that it offers little or no protection against spreading peritonitis of appendical origin.

When pain can be accurately localized, it is most apt to begin around the umbilicus, with a later shift to the right lower quadrant of the abdomen on the development of periappendicitis. Nausea and vomiting are constant symptoms in childhood appendicitis and usually occur subsequent to onset of pain. Temperatures of from 100° to 101° F. usually accompany appendicitis in children; they rarely exceed 102.6° F. except in patients with perforation and peritoneal involvement. The bowel is usually normal, but constipation prior to and during an attack of appendicitis is common, occurring in 26 per cent of the author's material. Diarrhea occurred in 83 children (16 per cent), almost all of whom had either spreading peritonitis or a pelvic appendicitis, most often with abscess, which resulted in irritation of the sigmoid. Urinary symptoms are uncommon, occurring in only 33 children in this group.

Abdominal tenderness is the most consistent objective sign and unquestionably the most reliable one in the diagnosis of appendicitis, being absent in only 2 of the 506 patients. Rectal tenderness was the second most common physical sign elicited in this series, being present in all but 15 cases of perforated appendicitis and absent in only 54 cases of simple acute appendicitis—a combined incidence of 87 per cent. Involuntary spasm of the rectus muscle was found in 64 per cent of all cases of unperforated, and in 94 per cent of the cases of perforated appendicitis.

In the differential diagnosis of acute appendicitis in children one must adequately exclude gastroenteritis, constipation, nontuberculous mesenteric adenitis, acute pyelonephritis, bronchopneumonia, and primary peritonitis. Rarely, acute rheumatic fever, acute poliomyelitis, diabetic coma, and synovitis of the right hip may be confusing. In babies and young children intussusception and the symptoms of acute otitis media may occasionally be mistaken for appendicitis.

The treatment of acute unruptured appendicitis in children by immediate appendectomy is the procedure of choice. Delayed operation, or ochsnerization, results in death from peritonitis before a localized abscess can be formed in a prohibitively high percentage of cases in childhood. Conversely, if early operation is employed for children with appendical peritonitis without adequate preoperative preparation, many unnecessary deaths occur from toxemia.

Since dehydration and ketosis are so common, even in children with early appendicitis, preoperative intravenous administration of dextrose in an isotonic solution of sodium chloride is used routinely by the author. For the seriously ill children with peritonitis, a constant intravenous drip is instituted for the infusion of plasma, as well as of dextrose and saline solutions. Sodium sulfadiazine is given parenterally in an initial dose of ½ gr. (0.03 gm.) per pound (0.5 kgm.) of body weight. Fowler's position, constant gastric suction by the Wangensteen method, morphine in three- to four-hour doses, and high concentration (95 per cent) oxygen complete the therapeutic regimen.

The decision as to time for operation in these cases is based on the response of the patient to this therapy with improvement in his clinical status as evidenced by his general appearance, a significant reduction in temperature, and, of greatest importance, a 20 to 30 per minute decrease in pulse rate with improvement in its quality.

The appendix was removed at the initial operation in 472 cases (93 per cent), while in 34 cases (7 per cent) it was deemed inadvisable to do more than incision and drainage. Of the latter cases 30 were later admitted for interval appendectomy.

The choice of incision for appendectomy in children depends on the size of the child and the type of appendicitis. Because of the small area which presents between the linea semilunaris and the anterior superior iliac spine in young children, the McBurney incision may give inadequate exposure, particularly of pelvic appendixes. The author restricts this incision largely to older children with early appendicitis and well localized tenderness of the right lower abdominal quadrant or with retrocecal appendicitis, and uses it as a means of extraperitoneal drainage of an appendical abscess. The right-rectus incision gives excellent exposure of the appendix in children with minimum retraction. Retraction of the rectus muscle is preferable to splitting of the belly of the muscle, since it insures a stronger wound. As medial retraction easily damages the nerve supply of the muscle, the author has recently employed lateral retraction almost exclusively.

The authors believe that drainage of the pelvis is distinctly useful in children with peritonitis of appendical origin. He uses soft, pliable rubber drains with a central core of gauze (Penrose). The drain is always led down into the pelvis along its lateral wall and should never be placed among loops of bowel or against the appendical stump.

Intraperitoneal administration of sulfonamide compounds was used in 72 appendectomies for perforative appendicitis with abscess or peritonitis. In 67 of these cases a drain was also employed. Sulfadiazine was used in 50 cases, sulfanilamide in 17, and sulfathiazole in 5. It seems to the authors that the intraperitoneal use of sulfonamide compounds offered no great advantage over the oral or parenteral use of sulfathiazole or sulfadiazine in reducing the incidence of these complications.

The importance of a well planned postoperative regimen for children with appendical peritonitis cannot be overemphasized. Bone-marrow infusions with their inherent danger of osteomyelitis, periosteal stripping, and subsequent sequestration, should rarely be used. Precautions must be observed to avoid overloading the child with excessive saline solutions. Repeated small transfusions of fresh whole blood are helpful for critically ill children with peritonitis. If suction and parenteral administration of fluids are necessary for more than two or three days, solutions of amino acids should be added to the parenteral feeding regimen.

Chemotherapy was administered postoperatively in 87 per cent of the cases of perforated appendicitis in this series. Sulfathiazole was used in 82 cases and sulfadiazine in 99. Both drugs seemed effective in diminishing postoperative toxicity, shortening convalescence, and reducing complications, but fewer reactions to the drug resulted with sulfadiazine.

There were 8 deaths in this series of 506 cases, an over-all mortality rate of 1.58 per cent.

JOSEPH K. NARAT, M.D.

Bagley, W. R., and Bagley, E. C.: Stenosis of the Sigmoid in the Newborn. *Minnesota M.*, 1945, 28: 455.

An infant was operated upon fifty-two hours after birth for congenital stenosis of the first part of the sigmoid. A colostomy was done above the obstruction and a small catheter inserted into the proximal end of the bowel. Following this the old McGraw method of enterostomy with necrosing pressure of a rubber band was done, and, finally, when the baby was five and one-half months old the colostomy was closed.

From this experience in 1 patient the author concludes that a preliminary colostomy in this type of case seems to be good practice. If there was adequate mobility of the bowel he would use the McGraw rubber-band-necrosis colocolostomy at the original operation. SAMUEL J. FOGELSON, M.D.

Dmytryk, E. T.: Congenital Malformations of the Anus and Rectum. A Clinical Study. *Arch. Surg.*, 1945, 50: 253.

Congenital malformations of the anus and rectum are said to occur in about 1 of every 5,000 newborn babies. Anomalies of the anus and rectum are classified by Ladd and Gross into 4 types, as follows: (1) incomplete rupture of the anal membrane, or stenosis at a point from 1 to 4 cm. above the anus; (2) imperforate anus with the obstruction due only to a persistent membrane; (3) imperforate anus in which the rectal pouch may end blindly, either in or above the pelvis; (4) normal anus and anal pouch with the rectal pouch ending blindly. There may be either a membranous obstruction between, or a separation of the anal and rectal pouches. When the pouches are separated, a cord of tissue without a lumen occasionally may connect them.

Fifteen patients with congenital malformation of the anus and rectum were studied by the author. Of these 15 patients, 5 (33.3 per cent) had anomalies of type 1, and 10 (66.6 per cent) of type 3. The sex distribution showed 4 males and 1 female with anomalies of type 1, and 8 males and 2 females with anomalies of type 3.

Five of the patients were found to have fistulas connecting the rectum with the genitourinary tract or perineum. Two types of fistulas were encountered in the males, viz., rectovesical and rectourethral. No rectoperineal fistulas were found. Of the females, 2 had rectovaginal fistulas and 1 had a rectum-fossa navicularis fistula. No rectovesical, rectoperineal, or combined rectovaginal and rectovesical fistulas were encountered.

Five patients had other associated congenital anomalies. These included absence of the gall bladder, horseshoe kidney, hydroureter and hydronephrosis, patent ductus arteriosus, anomaly of the ureters, hypospadias, an unusually large foramen ovale, and mongolian idiocy.

The treatment for the type 1 anomalies was satisfactory, but that for the type 3 anomalies was unsatisfactory, as judged by the mortality in this group. Basically, the production of colostomies for patients with symptoms of intestinal obstruction and the performance of primary perineal plastic operations on patients who were free of obstructive symptoms proved satisfactory. Two patients who had undergone primary perineal operations died of peritonitis as a result of perforation of the rectum and contamination of the peritoneal cavity. These were technical accidents. The 5 patients presenting obstructive symptoms, and upon whom colostomies were performed, died. One patient with a type 3 anomaly was given a barium sulfate meal as a diagnostic aid. This is contraindicated for this condition as well as for any other type of intestinal obstruction.

The choice of anesthesia for infants is limited to either local or drop ether anesthesia. The latter was used in all of the cases except 1, in which local anesthesia was used. JOSEPH K. NARAT, M.D.

Smith, G. V. S.: A Modification of an Old and Simple Method of Treating Rectal Prolapse. *N. England J. M.*, 1945, 232: 495.

Five cases of rectal prolapse treated by a modification of compression amputation are reported. The author states that from a review of the literature one would conclude that amputation of rectal procidentias by constriction is not a good procedure, since in the last twenty years there have been 2 operative deaths among 14 reported cases. There has also been considerable morbidity, as well as rectal stenosis, and the period of observation has been, for the most part, too short to decide about the permanency of cure. A fairly complete review of the literature of the last fourteen years leads one to the same conclusion concerning the various other methods of treatment, both abdominal and perineal. Either the morbidity or the mortality is similar, there is a high rate of recurrence, or good results are based on too short a period of observation. There is evidence that surgical amputation has yielded the best results in the past.

The author suggests that the mortality and morbidity with the constriction method appear to have come from technical errors and that this method should be just as effective as surgical amputation, with the advantage of being a much simpler procedure.

The procedure described is named the "garden-hose" technique. Older methods of achieving constriction amputation involved ligatures or elastic bands, and rubber tubing. The only original features of the present method are the cutting of a circular groove in garden hose, or building up a trough around it and applying drastic compression by twisting strong malleable copper wire around the protrusion. A circular groove 1.5 cm. wide is cut deeply 4.0 cm. from the end of the hose to be inserted into the rectum. The rectal sleeve is dragged out to its full length and carefully palpated for the presence of small intestine in the herniated pouch of Douglas. With the aid of lubricating jelly, the hose is inserted so that its groove comes just distal to the anal margin. Compression of the bowel against the groove is then produced, and to prevent the too early expulsion of the hose, the end of the prolapse is clamped to the outer end of the tube.

The minimal loss of blood and the short time required are in favor of this technique, and succinylsulfathiazole has removed its greatest danger, namely, sepsis.

Technical errors which appear to have contributed to the mortality and morbidity following the constriction method of treatment are:

The hose is inserted too far above the point of constriction, which allows the accumulation of feces between it and the rectum. Peristalsis could force some of this material through a weakened area in the tissues. There should be not more than a few centimeters of hose above the point of compression. It is probable that in some cases strangulation has not been complete, which permits greater septic and

toxic absorption. A slight increase in the diameter of the hose might have reduced the amount of stenosis which followed in the author's cases.

In 5 cases of reducible rectal prolapse in women the procedure has been safe, and the results in 4 cases have been good for periods varying from almost two to five years. In the fifth case, prolapse has twice recurred after twelve and eighteen months, respectively, of temporary cure. It appears that there will be an unavoidable percentage of recurrent rectal prolapse. JOHN L. LINDQUIST, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Teitelbaum, M., Curtis, A. C., and Goldhamer, S. M.: The Comparative Value of Several Liver Function Tests. *Ann. Int. M.*, 1945, 22: 653.

Eight different liver function tests were performed, at approximately the same time, on each of 153 patients with various types of suspected liver disease, and more than 50 presented definite evidence of cirrhosis, neoplasm, or hepatitis.

Urinary urobilinogen test. Urobilinogen is a pigment formed by the bacterial reduction of bilirubin in the intestine. A large part of the urobilinogen formed is excreted in the stool. Some is absorbed from the intestine and reconverted by the liver into urobilin. A small amount is excreted in the urine. In the presence of cellular liver disease, the amount of unconverted urobilinogen in the blood is increased, and is excreted by the kidneys. Because of the increased excretion of urobilinogen by the kidneys in some forms of liver disease, its quantitative estimation in the urine may be of value in determining the presence and extent of cellular liver disease.

In using the test, two factors must be remembered: (1) in spite of normal hepatic cellular activity, there may be an abnormal degree of urobilinogenuria associated with increased blood destruction; and (2) the normal liver cannot convert an abnormally large amount of blood pigment into bilirubin at the usual rate. In chronic renal disease, also, the test is of no value, because the kidneys cannot excrete the pigment. Of a series of 57 cases with definite liver disease, 75.4 per cent had abnormal excretions of urobilinogen. In the absence of obstructive jaundice, and in cases in which other causes of urobilinogenuria can be ruled out, the presence of urobilinogen in the urine in dilutions greater than 1:40 is significant. The test is easily and rapidly performed, and may help in establishing the diagnosis of liver disease. Because the test is roughly quantitative, it also has value in determining the progress of the liver injury.

Van den Bergh reaction. The presence of hyperbilirubinemia is always important in liver disease, and the quantitative *Van den Bergh* reaction is the most commonly used single liver function test. Pathologically, hyperbilirubinemia means either an obstruction of the bile ducts, an inability of the parenchymal liver cells to excrete all of the bile brought to them, or production of bile pigment from blood destruction, greater than the liver can excrete. In obstructive jaundice, the characteristic color occurs promptly upon the addition of the diazo reagent to the blood serum (direct reaction), whereas in hemolytic jaundice the color appeared only after alcohol was added (indirect reaction). The biphasic or delayed direct reaction indicates both free and protein-absorbed bilirubin in the blood stream, and suggests both obstruction of the large bile ducts or small intrahepatic channels, and reduced cellular activity of the liver. The *Van den Bergh* reaction is of greater value in determining the amount of jaundice than it is in estimating the presence and severity of liver disease. An extensive impairment of liver function may exist without jaundice, and severe jaundice may exist without liver damage. Among 58 cases of hepatitis, neoplasm, and cirrhosis, the reaction was positive in 51.7 per cent.

Galactose-tolerance test. Galactose has been chosen as a substance to measure the carbohydrate function of the liver, because there is no renal threshold for its excretion, the endocrine glands have no effect on its metabolism, and it is not utilized by tissues other than the liver. Forty grams of powdered galactose are given orally, and urine specimens are collected at hourly intervals for five hours. Water may be taken freely during this period. The 5 urine samples are then pooled, and the amount of sugar determined by the quantitative Benedict method. From this is calculated the amount of galactose in the urine. A total elimination of 3 gm. or more of galactose is an indication of liver disease. The test is least satisfactory in determining whether or not liver disease exists. Its main value is in the differentiation of a diffuse cellular intrahepatic lesion from other types, in which disease is due to an extrinsic obstruction. In patients with considerable jaundice, the test may be valuable early in the disease. When jaundice is due to hepatitis, a positive test is proof of cellular damage. The test was positive in 20.4 per cent of 54 patients with known liver disease. The test is not valuable in determining the presence or absence of liver disease. It is more likely to be positive in diffuse cellular disease (hepatitis) with jaundice than in other forms of intrinsic liver disease.

Glucose tolerance test. Because one of the major functions of the liver is the conversion of glucose to glycogen and then storing the latter, hepatic disease may in some instances produce a disturbance in glycogen metabolism. With damage to the liver, the storage of glycogen may be considerably impaired, and, when an excess of carbohydrate is given, it accumulates in the blood stream and is excreted by the kidneys. The presence of a high blood sugar stimulates the production of insulin, and, the increased combustion of glucose, in addition to its loss through the kidneys, may result in a hypoglycemic reaction during the third, fourth, or fifth hour after a high carbohydrate meal.

The standard method was employed, with 1.75 gm. of glucose per kilogram of body weight. The glucose

tolerance was abnormal in 70.4 per cent of 54 patients. If the test begins with a normal or low fasting blood sugar, which increases during the first or second hours to a level higher than normal and then falls to a hypoglycemic level during the third or fourth hour, it is probably indicative of liver disease. The glucose tolerance test is a much more delicate test of liver disease than is the galactose-tolerance test. To be positive, it requires extensive liver cell disease. It is, therefore, important in differentiating hepatitis from obstructive jaundice.

Serum proteins in liver disease. A. Blood-serum protein determinations — A reduction of the level of serum proteins has been noted in liver disease. The serum albumin is most often affected, and the globulin may be elevated. Serum albumin under 4.0 gm. per cent was considered abnormal. Of 57 patients with known liver disease, 84.2 per cent had a reduction of the serum albumin level below 4.0 gm. It appears that hypoalbuminemia is a good index of liver disease, and is especially valuable in indicating liver damage due to neoplasm and cirrhosis. It is independent of the presence or absence of jaundice. B. Takata-Ara test — Takata and Ara noted that when chest fluid from a patient with lobar pneumonia was added to a solution of sodium carbonate, mercuric chloride, and acid fuchsin, a precipitate of mercuric oxide occurred. The test has been used extensively as a liver function test. The total serum protein content plays no role, the reaction being dependent upon the globulin content of the fluid. The test was positive in 51.8 per cent of 56 cases with known liver disease, but it is not a specific test for cirrhosis, and it may be negative with known liver disease.

Bromsulfalein test. Five milligrams of bromsulfalein per kilogram of body weight are injected intravenously. A sample of venous blood is collected in thirty minutes and centrifuged, and the serum divided into two parts. One part is alkalinized with 2 drops of 10 per cent sodium hydroxide and compared with a set of color samples which indicate the per cent of the dye present in the blood. The second part is acidified with one drop of hydrochloric acid, and is placed behind the standard color tubes to give a similar background in comparing the unknown. Retention of more than 15 per cent of the drug in thirty minutes was considered abnormal. The test was positive in 91.2 per cent of 57 patients with known liver disease. This test is more delicate than any procedure considered for determining liver disease. In the absence of jaundice, the bromsulfalein test is the most valuable in revealing the presence of a parenchymatous liver injury.

Macrocytosis as index of liver disease. It is generally accepted that the substance necessary for the maturation of red blood cells is formed from the interaction of an extrinsic factor (food) with an intrinsic factor present in the stomach. The resulting product is absorbed from the intestine, stored in the liver, and utilized when needed. Disturbance of this mechanism at any point will produce a macrocytic anemia. The test was positive in 55.2 per cent of 58 cases with known liver disease. It is quickly done, is valuable in various types of liver disease, and is indicative of extensive liver damage, if other causes of macrocytosis can be ruled out.

In patients who are jaundiced, the best tests to use for the estimation of hepatic function are the serum protein determination (hypoalbuminemia) and the glucose tolerance test. In patients who are not jaundiced, the best tests to use are the bromsulfalein dye excretion test and the urobilinogen test.

The value of any liver function test is directly proportional to an appreciation of the function or functions it is testing. No one test can be considered the best test of liver function. SAMUEL KAHN, M.D.

Johnson, W. M., and Davis, O. T.: Pancreatitis; An Analysis of 22 Cases. *South. M. J.*, 1945, 38: 373.

The diagnosis of acute pancreatitis is based upon the clinical picture plus the finding of an elevated serum or urinary amylase and possibly x-ray evidence of an enlarged pancreas.

With the obstruction of the pancreatic ducts that takes place in acute pancreatitis, there is an overflow of the pancreatic juice into the lymphatics or capillaries and so into the circulation. While the concentration of all the pancreatic ferments in the blood will be increased, amylase is the one most quickly and easily demonstrated.

The normal amylase content of the blood serum ranges from 80 to 150 Somoggi units per 100 c.c. Values above 200 are definitely abnormal.

It should be remembered that the rise in serum amylase takes place within a very few hours and can fall to normal or below sometimes within less than twenty-four hours.

The authors do not consider acute pancreatitis as a surgical emergency. In the majority of cases the only treatment they advocate is the relief of pain.

EARL O. LATIMER, M.D.

Shallow, T. A., Eger, S. A., and Wagner, F. B., Jr.: Suppurative Pancreatitis with Associated Liver Abscess. *Ann. Surg.*, 1945, 121: 853.

The authors report in detail a case of suppurative pancreatitis followed by hepatic abscess. The patient was a middle-aged woman who had been well until three days before admission to the hospital. She had constant pain in the epigastrium and the right upper part of the abdomen. She was nauseated and had diarrhea. Her temperature was 103° F., pulse 130, respiration 26, and blood pressure 140/90. She was slightly jaundiced. There was marked tenderness in the right upper abdominal quadrant associated with rigidity and rebound tenderness. The original diagnosis was acute calculous cholecystitis, and conservative management was instituted. The patient failed to improve and on the sixth hospital day was operated upon with a preoperative diagnosis of acute cholecystitis.

At operation the gall bladder and biliary tract were free of any inflammatory process, but a large

abscess of the body of the pancreas was found, which was incised and drained. The quadrate lobe of the liver, on the inferior surface between the falciform ligament and the gall bladder, was bulging and pus was aspirated from this lobe of the liver. The lobe was incised and two abscess cavities were found and drained.

The postoperative course was satisfactory and the patient had not developed diabetes mellitus three months postoperatively. The authors interpret the suppurative pancreatitis as secondary to an acute hemorrhagic pancreatitis. The hepatic abscess, they believe, was probably due to bacterial invasion of the splenic vein. EARL O. LATIMER, M.D.

Whipple, A. O.: Pancreaticoduodenectomy for Islet Carcinoma. *Ann. Surg.*, 1945, 121: 847.

The author reports the first recorded one-stage removal of the head of the pancreas and duodenum, with occlusion of the pancreas. This operation was performed March 6, 1940 for an islet-cell carcinoma of the head of the pancreas. The patient has survived five years without evidence of recurrence of the tumor.

The author favors the one-stage procedure over his earlier two-stage procedure reported in 1935. He has found the following two steps of great advantage:

1. The implanting of the common duct into the jejunum, either end-to-end or end-to-side, according to the choice of the loop or Roux-type of jejunojejunostomy. This avoids the danger of a cholecystoenterostomy, and the serious complication of a biliary fistula as a result of the cutting through of the ligature on the ligated common duct.

2. The implantation of the pancreatic duct into the jejunal loop below the choledochojejunostomy. This eliminates all the uncertainty and debate regarding an occluded pancreas and possible fatty liver degeneration. EARL O. LATIMER, M.D.

GYNECOLOGY

UTERUS

Jeffcoate, T. N. A., and Lerer, S.: Hypoplasia of the Uterus with Special Reference to Spasmodic Dysmenorrhea. *J. Obst. Gyn. Brit. Empire*, 1945, 52: 97.

The authors present a critical analysis of hypoplasia of the uterus and its relation to spasmodic dysmenorrhea. This analysis is based on the case records of 829 patients complaining of dysmenorrhea. Only patients with a typical history of spasmodic pain are included. All cases in which associated lesions of the pelvis are present are excluded.

Of the 829 patients, 432 were single and 383, married. One hundred and ninety-five women complained of sterility.

The onset of menstruation occurred within normal limits in most of the cases. Only 3 per cent of the patients had scanty menstruation and there was a very low incidence of infrequent menstruation in the group reviewed.

Most of the uteri were 2½ to 3½ inches in depth.

Some type of minor developmental abnormality of the uterus was noted in a large percentage of the cases; acute anteflexion of the cervix was found in 368 cases, congenital retroflexion and retroversion in 50 cases, and conical cervix with or without pinhole os in 39 cases. The authors conclude from these figures that it is the malformation rather than the degree of development which is the factor causing the dysmenorrhea.

The endometrial patterns were studied in only 3 cases. However, the authors stated that their findings supported the view that menstruation characterized by pain is of the ovular type.

In this series of 829 cases of spasmodic dysmenorrhea, definite evidence of uterine hypoplasia was found in only 15 cases, and in 12 it was questionable, an incidence of 3.38 per cent.

A discussion of the therapy of hypoplasia of the uterus with estrogens is given.

In summary, the authors state that the pain of spasmodic dysmenorrhea is related in some way to contractions of the uterus. The difference between painful and painless contractions lies in their character rather than their strength. The theory that supposes inco-ordination of different areas of the uterus, or disturbed polarity of the uterus to be the cause of pain during menstruation has still to be disproved. Also there is not at present enough evidence to prove or disprove the theory which supposes uterine hypoplasia to be the cause of the abnormal uterine contractions. HARRY FIELDS, M.D.

Findley, D.: End Results in the Treatment of Cervicitis. *Am. J. Obst.*, 1945, 49: 614.

Two hundred and forty cases of chronic cervicitis were treated by the three generally accepted methods of electrosurgery, namely, nasal tip cauterization, electrocoagulation, and conization. Histological studies were made before treatment and after healing was clinically complete.

Comparisons were made as to the rate and type of healing following each therapeutic measure and also as to resultant complications. The average rates of healing were the same with all three methods.

The percentage of satisfactory results was greatest after electrocoagulation, next greatest after conization, and least following cauterization. There was very little difference between coagulation and conization in the end histological picture. Fibrous-tissue reaction was very low after the first two procedures, but slightly greater following cauterization.

The complications which were most commonly encountered were hemorrhage, stenosis, and pyometra, and were most frequently seen following conization. Hemorrhage usually occurred from the tenth to the fifteenth day, at the time of separation of the slough. Stenosis with resultant pyometra may be largely prevented by repeated dilatation of the cervical canal.

Carcinoma was discovered in 2 unsuspected cases among 240 examined. Internal tampons were found to interfere with proper healing. Their use is to be condemned. EDWARD L. CORNELL, M.D.

EXTERNAL GENITALIA

Cinberg, B. L.: Postmenopausal Pruritus Vulvae. *Am. J. Obst.*, 1945, 49: 647.

The theory is advanced that most cases of postmenopausal pruritus vulvae are basically due to a local atrophy of the skin. This permits an invasion and infection of the derma by the usual pathogenic skin organisms, which are always present in that region. The resulting inflammation affects the nerve terminations in the papillae of the derma and produces the itching. The macroscopic and microscopic pictures are largely determined by the individual's defense reactions. The same stimulus which will result in lichenification in one person will cause leucoplakia in another. The best method of obtaining relief is to protect the skin from any further irritation by the constant application of a bland ointment for at least three months.

An androgenic ointment should be used locally in those cases which exhibit severe vulval atrophy.

The successful treatment of 14 cases of severe postmenopausal pruritus vulvae, in which pretherapy and post-therapy vulval biopsies were obtained, are reported. Five of the patients had leucoplakia of the vulva. EDWARD L. CORNELL, M.D.

Sako, W., Tilbury, R., and Colley, J.: Gonorrheal Vaginitis. *J. Am. M. Ass.*, 1945, 128: 508.

The authors present their experiences with one-dose penicillin treatment of chronic gonorrheal vag-

initis in 16 children. Diagnosis was established by smear alone only if the case was clearcut and gram-negative diplococci were found in pus cells; otherwise culture was resorted to. Thirteen cases had received sulfonamide and/or estrogen therapy previously. Penicillin was administered only after all other types of therapy had been discontinued for one week. No local or systemic measures were used with penicillin.

Following one injection of 100,000 units intramuscularly, clinical and bacteriological cure, ascertained by the presence or absence of vaginal discharge, smears, and cultures, respectively, occurred within three days in 15 cases. The remaining case required further treatment with divided doses of penicillin. The single-dose method produces a rapid cure with maximum safety. Hospitalization is not required. WARREN R. LANG, M.D.

MISCELLANEOUS

Cohn, A., Taylor, H. C., Jr., and Grunstein, I.: Penicillin Treatment of Sulfonamide-Resistant Gonococcal Infections in the Female. *Am. J. Obst.*, 1945, 49: 657.

Various amounts of penicillin were used in the treatment of 108 adult female patients suffering from gonococcal infections. Of these, 101 had failed to respond to at least two courses of various sulfonamides; the remaining 7 patients showed a definite sensitivity to sulfonamide compounds.

Of the total of 108 patients, 99 promptly became bacteriologically negative after one course of penicillin treatment, and 9 by the administration of a second course of penicillin.

The results obtained by the administration of various amounts of penicillin point to the fact that a minimum dosage of 100,000 Oxford units, injected intramuscularly in divided doses, is both necessary and sufficient for bacteriological cure. The minimum total period of time required for successful therapy was found to be six hours. Smaller doses of penicillin and shorter total time of treatment were adequate in individual cases, but this type of therapy cannot be recommended.

Urethral discharge following penicillin therapy disappeared within a week; cervical discharge was not appreciably affected in the majority of cases. Acute symptoms and signs of adnexal involvement subsided within one to two weeks after penicillin treatment. There were 3 cases which had an exacerbation of the adnexal involvement immediately following the use of penicillin, and 1 patient who developed salpingitis following therapy.

After their discharge from the hospital, 81 of the total of 108 women were followed up for an average period of forty-three and six-tenths days, during which an average of 3.5 examinations were performed. Fifteen patients were found gonococcus-positive after an average follow-up of fifty-one and seven-tenths days. It may be assumed for various reasons that all these patients represent reinfections rather than recurrences. No serious toxic symptoms appeared in this group of patients treated with penicillin. EDWARD L. CORNELL, M.D.

Marwil, T. B.: Failure of Cure of Pelvic Infections following the Use of Penicillin. *Ann. J. Surg.*, 1945, 68: 336.

Fifteen patients with acute pelvic inflammatory disease were followed up for at least a year by the author. The treatment consisted of sulfadiazine followed by penicillin in total doses of from 500,000 to 600,000 Oxford units. This course was followed by two additional courses of penicillin if there was no relief of the symptoms or change in the pelvic pathology. In all of the cases the regime was considered to be unsuccessful because the patients all had both signs and symptoms of residual chronic pelvic inflammation.

The author concludes that in spite of the fact that penicillin is a specific for many of the organisms involved in the production of pelvic inflammatory disease, its use is not always successful because the return of the structures to their original condition is not accomplished. J. ROBERT WILLSON, M.D.

Carrington, W. J.: Acute Surgical Diseases of the Female Pelvis. *J. Am. M. Ass.*, 1945, 128: 434.

The author presents the results of a five-year study of all female patients admitted to one hospital with acute surgical lesions of the abdomen and the pelvis. The accurate diagnosis of acute surgical lesions of

TABLE I.—FEMALE PATIENTS WITH PELVIC AND LOWER ABDOMINAL EMERGENCIES AT THE ATLANTIC CITY HOSPITAL, ATLANTIC CITY, NEW JERSEY, FROM JANUARY 1, 1936 TO DECEMBER 31, 1941

Final diagnosis	Total	Tentative diagnosis correct	Per cent of accuracy
Acute appendicitis	950	778	80
Acute adnexitis	505	392	77
Acute lesions of the urinary tract	176	158	90
Endometriosis	77	12	16
Hernias, strangulated or incarcerated: 2 of these were intra-abdominal	53	50	90
Ruptured cysts; graafian follicle, corpus luteum, dermoid, pseudomucinous, and papillary cysts	51	31	60
Ruptured ectopic pregnancy, including ruptured tubal pregnancy and tubal abortion	49	28	57
Torsion of tumors, solid or cystic	15	7	47
Pelvic cellulitis	14	12	80
Mesenteric adenitis due to measles, scarlet fever, "glandular fever"	8	0	0
Tuberculous peritonitis	9	2	22
Mittelschmerz	8	0	0
Diverticulitis	7	2	28
Torsion of the omentum	4	0	0
Mesenteric thrombosis	3	0	0
Regional ileitis	2	0	0
Ruptured typhoid ulcer	1	0	0

the abdomen must of necessity be made rapidly. Preliminary diagnostic procedures may jeopardize the life of the patient. The value of certain clinical signs and symptoms, such as the posture of the patient, temperature, pulse and respiration, the localization of tenderness, cutaneous hyperesthesia, muscle spasm, abdominal masses, and abdominal auscultation is discussed. The author concludes after presenting his statistics in table I concerning the accuracy of the diagnosis, that a more thorough consideration of the history and of the physical examination will increase the percentage of correct diagnoses made.

J. Robert Willson, M.D.

Gardner, G. H.: Female Infertility. *J. Am. M. Ass.*, 1945, 128: 245.

The majority of childless marriages do not result from an absolute sterility either in the husband or in the wife: they are instances of relative infertility brought about by a multiplicity of factors in both spouses. More than half of the husbands must either share or accept full responsibility for a childless union.

A physician's examination must be thorough and should include: (1) a complete general physical survey, (2) a search for gross abnormalities in the female generative tract, (3) an evaluation of the male factor, (4) study of the uterine cervix, (5) testing of the oviducts for patency, and (6) an investigation of the endocrine system.

A general physical examination should evaluate the function of the glands of internal secretion.

The lower genital tract should be examined for infection; cervicitis should be looked for; and the patency of the cervix should be tested. The size of the uterus should be determined. Retrodisplacement of the uterus with anterior tipping of the cervix away from the seminal pool has been overemphasized. Endometriosis is a very frequent cause of infertility and should be suspected when the uterus is retroflexed and fixed, the ovaries enlarged and adherent, and when there are tiny, firm, sensitive nodulations either in the cul-de-sac, in the rectovaginal septum, or on the uterosacral ligaments. The author doubts that uterine fibroids are often responsible for infertility.

Examination of the semen is very important. The semen is placed in a glass container at room temperature. The accepted criteria for a normal specimen is: amount, from 3 to 4 c.c.; number of spermatozoa, about 100 million per cubic centimeter; motility, 85 per cent actively motile and migrating at room temperature; morphology, 80 per cent normally formed; and, finally, no more than an occasional leucocyte or red blood cell per high-power field.

The patency of the oviducts is determined by means of carbon-dioxide gas. Normally, a pressure between 40 and 80 mm. shows patency of the tubes. Nonpatency is proved at a pressure between 180 and 200 mm. Insufflation tests should be repeated 3 or 4 times, three to seven days following the menstrual period. Lipiodol injections are seldom indicated.

The next examination is the Huhner test. Several hours after intercourse the endocervical mucus should contain from 3 to 15 actively motile spermatozoa per high-power field.

The final diagnostic step is an endocrine survey. Of greatest help is the microscopic appearance of the endometrium within a few hours after the first show of menstrual blood.

The physician's obligation is a systematic elimination of each and every contributing cause that may be found in both the husband and wife, who must both co-operate wholeheartedly.

Catherine B. Hess, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

King, G., and Ride, L. T.: The Relation of Vitamin B_1 Deficiency to the Pregnancy Toxemias. A Study of 371 Cases of Beriberi Complicating Pregnancy. *J. Obst. Gyn. Brit. Empire,* 1945, 52: 130.

A very interesting study of 371 cases of beriberi complicating pregnancy is presented. These occurred in Hong Kong during 1939, 1940, and 1941. This represented a very definite increase in the incidence of beriberi over the preceding three-year period. There was also a definite increase in the incidence of pregnancy toxemia during this same period. The toxemia rate in Hong Kong was 3.45 per cent for the three years preceding this period of observation, and during the period it was 7.82 per cent.

Of 371 cases of beriberi complicating pregnancy, 252 cases were further complicated by pregnancy toxemia. In other words, in 70 per cent of the cases suffering from beriberi, pregnancy toxemia was present in one of its forms.

The authors suggest that the primary factor responsible for the heavy increase in pregnancy toxemia during the years under review was Vitamin B_1 deficiency.

They suggest that Vitamin B_1 for prophylactic and active treatment is the most important single measure in dealing with pregnancy toxemia in any of its forms.

A deficiency of Vitmain B_1 may arise from (1) a deficiency in the diet, (2) failure of absorption, (3) deficient storage capacity, (4) failure of utilization, or (5) an increased requirement.

The doses of thiamine used in the treatment of the authors' cases varied from 20 to 60 mgm. daily. Some patients with severe symptoms received as much as 2,000 mgm. during their course of treatment.

The therapeutic effect of the administration of Vitamin B_1 during these observations was often as marked in severe pregnancy toxemia as in typical cases of beriberi. In many patients suffering from severe pre-eclampsia, it was believed that the onset of convulsions was averted by vigorous treatment with Vitamin B_1 in addition to the usual methods used for such cases. HARRY FIELDS, M.D.

Arnell, R. E., and Watson, S. L.: Intercurrent Eclampsia; An Analysis of 52 Consecutive Personal Cases without a Maternal Fatality, with a Special Note on the Termination of Pregnancy in Antepartum Eclampsia. *South. M. J.,* 1945, 38: 386.

The authors report on 151 cases of all varieties of eclampsia; of these 52 became intercurrent and they were being classified as such because delivery did not take place until after an interval of more than three days after termination of the convulsions. The period between the final convulsion and delivery was eight days or more in 26 patients, and eleven days or more in 13 patients. There was a gross fetal mortality rate of 24 per cent, but there were no maternal fatalities.

Conservative measures were used throughout and the authors advised that pregnancy should be terminated without delay in patients who do not respond to therapy or who suffer a relapse; but generally the termination of pregnancy is deferred for a period of time after the eclampsia is definitely controlled.

Management of the convulsive stage includes a dark, quiet room, continuous nasal oxygen, blood-pressure determinations every half hour, and a retention catheter put in place. Sedation is limited to the amount needed to control the convulsion and usually consisted of morphine sulfate (gr. ¼) and sodium phenobarbital (gr. 5) subcutaneously. Additional support was obtained with 20 c.c. of 10 per cent magnesium sulfate injected slowly into a vein. Sodium amytal is given intravenously in doses of from 3 to 6 gr. or the dose of morphine is repeated if convulsions persist. Intravenous fluids are limited to the smallest amounts necessary to restore a satisfactory urinary output. A patient with evidences of pulmonary edema is given from 50 to 150 c.c. of 50 per cent dextrose in distilled water, and a patient with evidences of dehydration is given 1,000 c.c. of a 5 or 10 per cent solution. The patient who presents neither of these conditions is given 500 c.c. of a 20 per cent solution. If at the end of four hours the urinary output is less than 30 c.c. per hour, an additional 50 c.c. of the 50 per cent solution may be given.

Management of the postconvulsive stage, which is characterized by coma, semicoma and restlessness follows. Termination of the pregnancy at this time is particularly dangerous. Nasal oxygen should still be continued and aspiration used when needed. A large dose of magnesium sulfate should be given by mouth as soon as the patient is able to swallow. Doses of from 1.5 to 3 gr. of phenobarbital at three- to six-hour intervals are sufficient. Dextrose administration by vein may be continued, but usually the oral administration of 200 c.c. per hour is enough.

The management of the controlled eclamptic stage, which is that period between the postconvulsive stage and the onset of labor, requires little sedation and large quantities of fluids by mouth. Blood pressure determinations (every four hours), qualitative and quantitative urinalyses, daily hematocrit determinations, and renal and hepatic function tests are made. The daily fluid intake is maintained at 4,000 c.c. or over, and a high protein diet of 100 gm. is given.

If the patient is in good condition and close to term, there are indications for reasonably prompt

induction. The simplest method of medical induction consists in giving 1½ ounces of magnesium sulfate by mouth, followed by an enema, and later in giving pitocin in a dose of 0.5 minim and increasing it every twenty minutes until 3 minims is reached or contractions begin. This course is repeated every twenty-four to forty-eight hours. Operative procedures, whether vaginal or abdominal, are held to a minimum, to avoid the ill effects of unnecessary trauma, anesthesia, blood, and infection in these highly susceptible subjects. If surgery is necessary any variety of anesthesia except local infiltration is regarded as dangerous; no exception is made of the caudal technicque.

CATHERINE B. HESS, M.D.

White, P.: Pregnancy Complicating Diabetes. *J. Am. M. Ass.*, 1945, 128: 181.

Whereas the maternal mortality in diabetic pregnancies is low, the fetal mortality is still high. The fetal mortality rates range from 30 to 60 per cent, according to the length of the pregnancy observed.

The author has noted 4 salient abnormalities in these patients, and classifies them as: (1) maternal, (2) obstetric, (3) chemical, and (4) fetal. She further evaluates these abnormalities as they have occurred in a series of 181 consecutive diabetic pregnancies. In this series there were 1 maternal death and 29 fetal deaths.

The pregnancy abnormalities are (1) vascular disease and (2) hypo-ovarianism. Vascular disease is almost inevitable in young diabetic patients in whom the duration of diabetes exceeds fifteen years. Today nephritis has replaced sepsis, and is replacing coma as a cause of death of the young diabetic patients.

Ovarian failure is indicated by an increase in the serum level of follicle-stimulating hormones, by amenorrhea, and metrorrhagia. Atrophy of the ovary with poor follicular development is the only consistent pathological change reported in the endocrine glands, other than the changes observed in the pancreas itself.

The abnormal obstetric findings in cases of pregnant diabetic patients can be grouped under 5 main headings: (1) spontaneous abortions, occurring in 25 per cent of the cases; (2) pre-eclamptic toxemia, in 36 per cent; (3) breech presentation, in 33 per cent (4) uterine inertia; and (5) failure of lactation in nearly 100 per cent.

The chemical abnormalities are: (1) a low renal threshold for glucose, (2) water retention, and (3) the imbalance of the sex hormones of pregnancy. This latter imbalance consists of a fall of pregnandiol and a rise of chronic gonadotropin. This occurred in 70 per cent of the 181 cases discussed.

Fetal abnormalities are physical, chemical, and pathological. A birth weight above the average was found in 80 per cent of the infants of diabetic mothers. This is due to obesity, edema, and splanchnomegaly—the liver, spleen, and heart, especially being involved. The second fetal abnormality is the high incidence of congenital defects, usually involving tissue which is mesenchymatous in origin. The pathological characteristics of the infants of diabetic mothers are enlargement of the liver, spleen, and heart, excessive hemopoiesis of the liver and spleen, and islet hyperplasia.

The author believes that correction of the hormone imbalance is the most important aid that can be given the pregnant diabetic. Statistics in this group of patients have indicated that correction of hormone imbalance gives greater fetal salvage.

From this study, the rules for the management of the pregnant diabetic patient are concerned with the diabetic, obstetric, endocrine, and pediatric phases. The diabetic diet should be liberal in calories, 30 calories per kilogram of actual body weight; high in protein, 2 gm. per kilogram of body weight; and adequate in carbohydrate, up to 200 gm. daily, 150 for the mother and 50 for the fetus. Because of the low renal threshold, multiple small doses rather than a single large dose of insulin have been employed. Sodium chloride is restricted, and in abnormal cases ammonium chloride is administered.

The delivery in the abnormal cases is premature, the time of choice being the latter part of the thirty-seventh or the early part of the thirty-eighth week. Cesarean section for this particular group is the choice of the author. Anesthesia is spinal and sedation is prohibited.

Endocrine therapy is recommended in the form of diethylstilbestrol and progesterone, 15 mgm. of each daily, given intramuscularly.

The infant requires more than average drainage, mechanical stimulation, dehydration, heat, and oxygen.

HARRY FIELDS, M.D.

Wolff, J. R. and Limarzi, L. R.: Anemia in Pregnancy. *J. Am. M. Ass.*, 1945, 128: 482.

An analysis of the peripheral blood by means of capillary or vein puncture gives an incomplete picture of the state of the blood-forming organs. Bone-marrow examinations, however, disclose both the existing state of the hemopoietic system and the immediate future of the peripheral blood. The authors used both of these methods to study anemia during pregnancy.

Physiological anemia of pregnancy:

Since both the hemoglobin and erythrocyte values are usually lower in the pregnant than in the non-pregnant individual, it was previously thought that normal pregnancy produced a true iron-deficiency anemia because of the demands of the fetus for iron, the lack of iron in the diet, or the poor iron absorption resulting from the altered gastric secretion during pregnancy. On the other hand, it has been amply demonstrated that although both the cellular and plasma contents of the blood rise during pregnancy, the former fails to keep pace with the latter and a physiological anemia or hydremia is finally produced.

One hundred and five normal pregnant patients were examined. A lowering of the hemoglobin, ery-

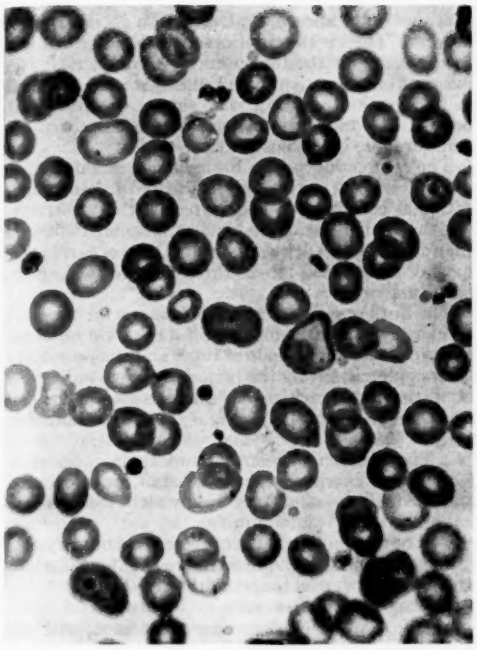

Fig. 1. Normal pregnancy: peripheral blood, showing the normocytic normochromic anemia.

throcyte, and hematocrit values began in the third or fourth month, becoming more marked by the sixth or seventh month, and a return to normal was observed at approximately the sixth week postpartum. Determinations of the mean corpuscular volume, the mean corpuscular hemoglobin concentration, the icterus index, reticulocyte percentages, and differential counts tended toward normal values. In some cases macrocytes were found. Platelets were normal or increased slightly.

Studies of the bone marrow disclosed a normal erythropoietic pattern. Myelopoiesis was increased during all trimesters and especially so during the last month and the puerperium. A tendency toward granulopoietic immaturity was noted. During the latter months there was an evident megakaryocytic hyperplasia. It should be mentioned that hyperplastic medullary changes are merely a part of similar physiological changes occurring elsewhere in the gravid organism. With the findings as described, recovery is spontaneous following delivery and consequently no therapy is necessary.

Ten cases of iron-deficiency anemia in pregnancy were studied. The essential feature is that the erythrocytes lack hemoglobin. The hemoglobin is usually below 10 gm., and the mean corpuscular hemoglobin concentration is less than normal. In 4 cases the cell volume was normal (normocytic hypochromic anemia) and in 6 cases the cell volume was low (microcytic hypochromic anemia).

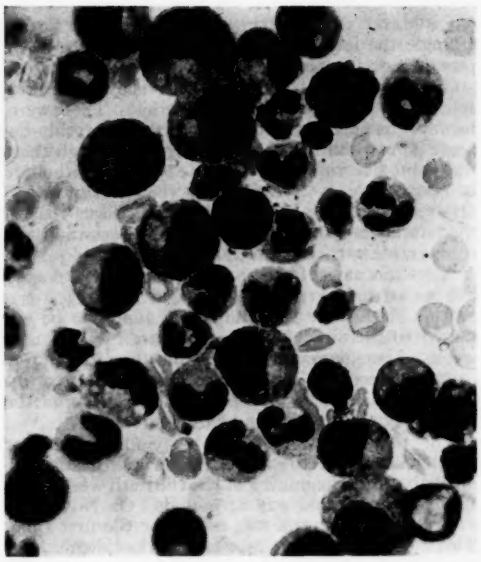

Fig. 2. Normal pregnancy: bone marrow, showing normal erythropoiesis and myeloid hyperplasia.

The bone marrow showed a normoblastic erythropoiesis. In 1 case many pronormoblasts were seen. Otherwise the medullary findings were as described previously. Iron therapy is indicated in such anemias.

True pernicious anemia during pregnancy is very rare. The authors observed 3 cases, all in white women who were in the ninth month of pregnancy, with a megaloblastic bone marrow identical with that of addisonian anemia.

According to the peripheral blood alone, one had a macrocytic, another a microcytic hypochromic, and the third a normocytic normochromic anemia. In addition to the megaloblastic reaction of the bone marrow, there was noticed a pathological granulopoiesis resulting in the so-called pernicious anemia neutrophiles (macropolycytes) in the peripheral blood. In all of these cases liver extract is indicated.

In summary, the authors advise study of the sternal bone marrow in the rational treatment of anemia during pregnancy. Co-operation between the obstetrician and the hematologist is recommended.

WARREN R. LANG, M.D.

Siddall, R. S.: Pregnancy after Renal Biopsy in Hypertensive Disease. *Am. J. Obst.* 1945, 49: 782.

The patient was thirty years old and had a blood pressure of 205/120. The heart was slightly enlarged, but the sounds were clear and of good tone. Funduscopic examination showed no neuroretinitis. All the usual laboratory tests as well as many special studies were made, with negative results.

On March 16, 1942, through an incision in Petit's triangle the lower pole of the right kidney was exposed and a biopsy specimen obtained. Various stains of sections from this tissue showed arteriosclerosis of all the arteries and arterioles. There were, however, no necrotic areas and no demonstrably definite glomerular or tubular changes, although there was some question regarding the tubular epithelium in certain areas. According to the descriptions of Castleman and Smithwick, the picture was that of moderately advanced renal vascular disease and was comparable to their grade 2.

After discharge from the hospital there was only one menstrual period, which began April 24, 1942, and on August 11 the uterus was found to be enlarged to the size of between fourteen and sixteen weeks of pregnancy. At that time the only finding of importance was a blood pressure of 220/135. In view of the dangers anticipated, interruption of the pregnancy was advised, but this was refused.

The pregnancy progressed uneventfully, except for persistence of the hypertension and headaches, until about the beginning of the thirtieth week. The total weight gained was 14 pounds. On November 14, 1942, albuminuria was noted for the first time. This increased from a slight to a marked degree, and many hyaline casts had appeared by November 18, although the systolic blood pressure remained around 220. After admission to the hospital on November 20, the ordinary and special tests were repeated with essentially normal results in most instances.

Headaches now became progressively worse until by the end of a week the patient complained of almost constant pain in the head, which was so intense as to greatly interfere with sleep. Vomiting also became frequent.

On November 28, 1942, classical cesarean section was done under general anesthesia. The child, a 4-pound, 1-ounce male, was in good condition at birth but died of prematurity and atelectasis after forty-nine hours. Recovery of the mother from the surgical standpoint was uneventful.

This case tends to confirm the previously debatable but yet commonly held clinical opinion that essential hypertension (without kidney changes except for arteriosclerosis) is likely to go on to renal functional impairment when complicated by pregnancy.

EDWARD L. CORNELL, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Fulton, A. A.: Puerperal and Lactational Mastitis in An Industrial Town. *Brit. M. J.*, 1945, 1: 693.

Cases of puerperal and lactational mastitis in an industrial town of 43,000 inhabitants, in Scotland, were studied from September, 1941 until December, 1943. The town has a municipal hospital with 30 beds.

There were 1,751 deliveries during the period of observation, 42.7 per cent in the hospital and 57.3 per cent at home. The criterion for diagnosing mastitis consisted of the presence in a breast of fluctuation and spontaneous evacuation on incision of an abscess. The incidence of mastitis as described was 8.9 per cent for the total number of deliveries; 77.6 per cent of the patients with mastitis were delivered in the hospital and 22.4 per cent were delivered at home. The highest incidence of mastitis occurred three or more weeks postpartum.

The interesting points brought out in this article are as follows: (1) the high incidence of this complication as compared to the figures of other observers; (2) the higher incidence among hospital deliveries than among home deliveries; and (3) the occurrence of most of the cases as late as three or more weeks postpartum.

The author gives as possible reasons for the high incidence of mastitis, more careful observation of patients over longer periods of time, and the possibility of an epidemic during the period of these studies. As far as the higher incidence of mastitis among hospital deliveries is concerned, several factors are enumerated:

1. The presence of micro-organisms in cases of infection, in "carriers" (patients, staff, and visitors), and in dust, to which the newly delivered woman has not acquired an immunity
2. The possibility that in overcrowded nursery conditions the infant acquires micro-organisms which are later transferred to the mother
3. The tendency to overcrowd institutions
4. The rigid hospital routine of feedings, with unduly long intervals (usually four hours) between feedings, which encourages stasis
5. Malnourishment of the mothers, which predisposes to infection

To account for the greatest incidence of mastitis during the third week postpartum, the author suggests a break in prophylactic hospital technique as soon as the patient leaves the hospital, a long incubation period for infection acquired in the hospital, and the fact that patients leave the hospital before the time of greatest susceptibility.

HARRY FIELDS, M.D.

MISCELLANEOUS

Bell, T. F.: Cesarean Sections in Oakland in 1943. *West. J. Surg.*, 1945, 53: 139.

This study presents the experience with cesarean deliveries in the five major hospitals of Oakland, California, during the year of 1943. Two hundred and ninety cesarean sections, representing 4.07 per cent of the total number of deliveries, were performed. The incidence varies from 1.14 per cent in the county hospital to 9.97 per cent in a private institution. All but 3 of the patients in this series were white.

Ninety-six per cent of the women were at term, or in their last month of pregnancy; 11 patients were in the seventh or eighth month of pregnancy. The indications for operation in the latter group were accidental hemorrhage and toxemia. Eight babies were known to have survived.

In nearly 54 per cent of the women the pregnancy was the first. In most of the multiparas the indication for operation was a previous cesarean section. However, accidental hemorrhage, toxemia, previous difficult labor, and disproportion accounted for about 25 per cent of the indications in the multiparas.

Obstetricians attended 58 per cent of the patients, and general practitioners attended 42 per cent.

The operation was elective in 56 per cent of the cases.

The low cervical operation was performed in 52.5 per cent of the cases, and was preferred in three of the five hospitals; in two hospitals the classical operation was the procedure of choice. In the low operation the transverse incision was made in the uterus in approximately 60 per cent of the cases. In 9 cases the uterus was removed at the time of cesarean section.

Sterilization was combined with cesarean section in 82 cases—by ligation of the tubes in 47 cases and by the method of Madlener in 26 cases. In addition, 9 patients were sterilized as a result of the Porro operation. In 4 patients the only reason for operation was sterilization, which is an unjustifiable procedure.

Nitrous oxygen and oxygen was the basic anesthetic in most cases. Spinal anesthesia was used 7 times and local anesthesia 4 times.

Consultation before operation was obtained in only 23 per cent of the cases in spite of the fact that 42 per cent of the attendants were general practitioners.

The fetal mortality was 4.8 per cent. Prematurity accounted for 4 fetal deaths, the time of operation being ill-chosen. The other fetal deaths were due to placenta previa or premature separation of the placenta. In 3 cases of ablatio placenta in the latter group, the deaths were certainly not preventable.

Since 64.5 per cent of the patients had no labor before cesarean section, it is impossible to determine how many may not have needed abdominal delivery. It would seem that every patient should have a test of labor, unless there is a definite contraindication.

The indications for cesarean operation were varied and many. Previous section headed the list; disproportion and contracted pelvis came next. Many unusual and bizarre reasons were given which did not seem tenable. Placenta previa accounted for 8 per cent of the indications, toxemia for 6.5 per cent, and premature separation of the placenta for 5.5 per cent. Blood transfusion was used infrequently in the bleeding cases. Convulsions occurred in 2 toxemic patients. There were no fetal deaths in the toxemic patients. X-ray pelvimetry was infrequent before operation.

There were 2 maternal deaths—1 from toxemia, the other from hemorrhage associated with placenta previa. This is considered a very good record. Whether either of the patients could have been saved by different treatment is open to question. There were no deaths from sepsis.

One notable feature about the series is the scarcity of multiple operations. Appendectomy with cesarean section was performed in 2 cases, and myomectomy with cesarean section in 1 case, excluding the 9 Porro operations.

A plea is made for more complete hospital records. In many cases the indications for operation were not understandable from the records. Many cases of contracted pelvis had nothing to support such a diagnosis.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Hinman, F.: Hydronephrosis. The Structural Changes. *Surgery*, 1945, 17: 816.

Hinman believes that many questions relating to the mechanism of hydronephrosis will remain unanswered until a new, more accurate method of determining the structural and functional unit of the kidney is discovered. At present neither the method of reconstruction nor teased dissection is adequate to demonstrate the late changes in hydronephrosis. Interpretation of renal changes in hydronephrosis in man is complicated by the glomerular and tubular peculiarities of the animals used in the experimental approach. The unipolar kidney of the rat, guinea pig, rabbit, cat, dog, sheep, and whale is structurally different from the multipolar kidney of the cow, monkey, pig, seal, and man. The renal blood supply varies considerably in different animals and is unique in the cat.

The term "traumatic" is used by Hinman to describe the early changes of hydronephrosis. The surface of the kidney is edematous and hemorrhagic; engorgement and hemorrhage are seen on section; and papillary tears are in evidence. Gradually the continuity of the pelvic epithelium is restored and the later changes of atrophy become evident. The effect of continued back pressure differs with respect to the glomerulus and its tubule. The effect of back pressure on the tubule is dilatation with flattening of its epithelium, leucocytic infiltration, and connective-tissue replacement. Late in the stage of the process the glomeruli show little if any fibrosis or hyaline change. With present methods, connection of these fibrotic tubules with these glomeruli cannot be demonstrated. The degree of hydronephrotic atrophy varies from species to species and in the same animal according to the blood supply. Whereas pressure atrophy seems uniform, ischemic atrophy varies according to the degree and localization of the vascular compression. Ischemia hastens the atrophy from compression.

"Even after many years of study by many different men, the structural changes of hydronephrosis are poorly understood." WILLIAM W. SCOTT, M.D.

Hinman, F.: Hydronephrosis. The Functional Changes. *Surgery*, 1945, 17: 836.

Hydronephrotic atrophy appears to be distinct and separate from primary atrophy occurring in other glands after complete obstruction of their ducts. In the kidney the destruction is prolonged for months and if the obstruction is removed before death of all the secretory units, these will recover and still function. Hinman defines hydronephrosis as "the term applied to the renal changes of distention and atrophy which follow urinary obstruction. The fluid causing the distention is urine, and the condition presupposes continued secretion of urine in spite of obstruction." As the hydronephrosis progresses, the contents of the renal sac become more dilute and with complete atrophy they are nothing but water and salt. Every hydronephrotic kidney appears to be a functioning kidney even with complete obstruction. With partial obstruction, except for the rate of production, the changes of hydronephrotic atrophy are indistinguishable from those of complete obstruction. Analysis of the contents of a hydronephrotic sac shows that it resembles more and more the glomerular filtrate. This indicates renal work after obstruction. Since the products of excretion cannot find outlet through the obstructed ureter, some other pathway must be used. Several are considered: 1. Tubular reabsorption in excess of normal probably occurs, although this pathway is thought to be insufficient in hydronephrosis. Moreover, Henle loops soon disappear. 2. Absorption of total urine through the fornix calicis may occur physiologically without rupture of the fornix. 3. Pyelovenous backflow is physiologically possible.

The main controversy hinges on the site or sites of reabsorption in hydronephrosis. At present this controversy has not been resolved.

WILLIAM W. SCOTT, M.D.

Hinman, F.: Hydronephrosis. Hydronephrosis and Hypertension. *Surgery*, 1945, 17: 845.

Hinman believes that hypertension develops in patients with hydronephrosis in the same way it develops in other individuals. He believes that hydronephrosis rarely causes hypertension. All attempts to produce hypertension by ureteral obstruction with resultant hydronephrosis have been unsuccessful.

Clinically, hypertension is uncommon in unilateral hydronephrosis; it is somewhat more common in bilateral involvement. Of 260 cases of hydronephrosis observed by Hinman in a four-year period, 212 presented normal blood pressures and 48 presented hypertension. Twenty-two of these cases presented unilateral hydronephrosis and of the 22 patients, 9 underwent removal of the hydronephrotic kidney. In 1 of these 9 the blood pressure was reduced.

WILLIAM W. SCOTT, M.D.

BLADDER, URETHRA, AND PENIS

Schaefer, A. A., and Sakaguchi, S.: Exstrophy of the Bladder. *J. Pediat.*, S. Louis, 1945, 26: 492.

Exstrophy of the bladder is always associated with a complete epispadias, a complete separation of the pubic bones, and a wide diastasis recti. These anomalies are considered to be due to arrested development in the caudal portion of the fetus.

The successful treatment of exstrophy of the bladder resolves itself into bilateral ureterosigmoidostomy and removal of the bladder. The tech-

nique of ureterocolonic anastomosis is briefly discussed. Coffey was the first to suggest that a valve-like mechanism preventing reflux of the feces into the ureters could be effected by allowing the ureter to lie for a short distance in the submucosa before it entered into the lumen of the intestine.

Since delay in operation for exstrophy of the bladder is associated with a high mortality due to renal infection and resultant renal failure, operation is advised at an early age. Higgins reported on 19 infants; 2 of the infants died and the remainder progressed satisfactorily.

The authors present reports on 3 patients; in 2 of these children the first ureterosigmoidostomies were performed at the age of eight and one-half weeks and ten weeks respectively. In each case the ureterointestinal anastomosis was performed in two stages by the Stiles-Mayo technique. This method is to cut the ureter obliquely at its lowest point. A catgut suture is passed through its point and tied; the urine guide is threaded into the ureter. Through a small transverse incision in one of the taenia coli, the mucosa is punctured and the ureter is passed into the colon. The needle is brought out ½ inch lower down and the ureter is anchored by the catgut tie. The ureter is then buried in the wall of the intestine for a distance of 1½ inches by two rows of Lembert sutures. Wound infection after cystectomy was common.

The period of hospitalization after the primary operation averaged four months, and plastic repair of the ventral hernias was postponed in 2 cases. The results were good. ERNEST E. ARNHEIM, M.D.

Folsom, A. I., and O'Brien, H. A.: The Female Urethra. *J. Am. M. Ass.*, 1945, 128: 408.

The authors call attention to a condition—papillary or granular posterior urethritis—which they believe is frequently overlooked. With reference to its etiology, apparently little is known. Two groups of clinical symptoms, bladder irritation and pain, are discussed. The bladder irritation is characterized by frequency and burning which varies in severity and may occur in attacks or even constantly. The pain is said to be a referred pain manifesting itself in different locations as in the right or left lower iliac region, the lumbosacral region of the back, in either loin, and in the inner aspects of the thighs. The urine is usually free from pus.

The treatment advised consists in progressive, careful dilatation of the urethra to 30 or 32 F. followed by fulguration of the pathological tissue in the posterior urethra. A repetition of the procedure may be necessary after a period of rest. In resistant cases chronic endocervicitis may be a factor; this requires treatment. WILLIAM W. SCOTT, M.D.

Shlionsky, H., Sarracino, L. R., and Bischof, L. J.: Functional Enuresis in the Army; Report of a Clinical Study of 100 Cases. *War Med.*, Chic., 1945, 7: 297.

A clinical neuropsychiatric study was made of 100 men with functional (nocturnal) enuresis in an Army training camp in the United States. The educational and occupational background of the group was, in general, below average. Most of the men had lived in rural communities and used outdoor toilets in childhood.

There was a high incidence of enuresis in the immediate members of the soldiers' families (parents, siblings, and children). A considerable number of men gave a history of disruption of the home or of exposure to various other unfavorable types of emotional environment in childhood. There was no definite evidence of mild or arrested forms of heredodegenerative disease (or so-called myelodysplasia) in any of the series. Simulated enuresis could not be demonstrated in any of the group.

There was a relatively high percentage of men in the categories of below average intelligence (dull-normal, borderline, and moron). The vast majority of them manifested, in addition to enuresis, various neurotic tendencies and personality disorders, usually beginning in early childhood. Most of the men showed evidence of emotional immaturity, dependence, and a passive type of personality makeup. Not infrequently there was persistence or recurrence of some of the various so-called neurotic traits and habit disorders of childhood, such as nightmares, nail biting, stuttering, fear of the dark, sleepwalking, and talking in sleep. Functional backache was a common symptom. Virtually none of the men had ever received adequate medical attention for the enuresis prior to the period of Army service.

Functional enuresis in adults is generally but one manifestation of a life-long pattern of neurotic behavior or personality maladjustment, and is not infrequently associated with inadequate intelligence. Apart from the consideration that the symptom of enuresis itself creates a difficult situation in the service, it is apparent that the large majority of enuretic adults do not possess the emotional or intellectual qualifications necessary for the successful performance of duty in the armed forces.

JOHN A. LOEF, M.D.

GENITAL ORGANS

Nicholson, N. F.: Carcinoma of the Prostate in a Youth. *Brit. J. Surg.*, 1945, 32: 533.

Nicholson reports the case of a boy fifteen years of age who developed symptoms of vesical-neck obstruction ending in urinary retention and requiring suprapubic cystotomy.

At the time operation was performed a nodular craggy swelling the size of a tennis ball was found in the region of the prostate gland. The patient died the day after operation and sections taken through the prostate at autopsy revealed a typical cellular carcinoma.

According to the author this case represents the youngest patient yet reported with a carcinoma of the prostate. Gardiner and Cummings in 1912 reported a similar case in a boy seventeen years of age.

WILLIAM W. SCOTT, M.D.

MISCELLANEOUS

Romansky, M. J., Murphy, R. J., and Rittman, G. E.: Single-Injection Treatment of Gonorrhea with Penicillin. *J. Am. M. Ass.*, 1945, 128: 404.

The authors succeeded in prolonging the action of calcium penicillin by suspending it in beeswax-peanut oil.

One hundred and seventy-five cases of gonorrhea in males were treated by a single injection of calcium penicillin in beeswax-peanut oil. There were no failures among 75 patients receiving a single injection of 150,000 units. Ninety-three of the 100 patients who received a single injection of 100,000 units were cured. The remaining 7 who received 100,000 units were not benefited, but responded to a second single injection of 150,000 units of penicillin in beeswax-peanut oil.

A single injection of from 100,000 to 150,000 units of calcium penicillin in beeswax-peanut oil will produce and maintain assayable levels of penicillin in the blood for seven and one-half to ten hours, with the excretion of penicillin continuing in the urine for from twenty-four to thirty-two hours.

The penicillin in beeswax-peanut oil mixture has produced no abnormal reactions locally or constitutionally.

Striking features in the treatment of the patients with penicillin in beeswax-peanut oil were the rapid disappearance, usually within seven hours, of the subjective symptoms, especially frequency and pain on urination; the rapidity with which the purulent discharge became mucoid and disappeared; and the early attainment of bacteriological negativity.

Twenty-four hours following the injection slight soreness to pressure was present, but this was gone within forty-eight hours. In none of the patients in this series were there any allergic manifestations to the mixture. No history of sensitivity to peanuts was obtained.

JOSEPH K. NARAT, M.D.

Jepson, R. P., and Whitty, C. W. M.: On Sulfadiazine Dysuria. *Lancet*, Lond., 1945, 248: 751.

In a series of 450 head wounds treated with high sulfadiazine dosage, 17 cases of dysuria were seen. The incidence bears a close relation to the urinary *p*H; no case occurred with a *p*H of over 6.5. Neither the total dosage nor length of the administration appears to affect the incidence.

The clinical picture is clear-cut: intense abdominal pain with loin tenderness, oliguria, and blood-stained urine.

Prophylaxis depends on the control of the urinary *p*H and output. Treatment is by intensive administration of intravenous fluids with alkalis. In only 5 cases was ureteric catheterization done, and it was necessary probably only in 2. None of these cases was fatal, although 1 patient died of other causes shortly after the urinary symptoms had cleared.

JOHN A. LOEF, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Dickson, D. D., Camp, J. D., and Ghormley, R. K.: Osteitis Deformans; Paget's Disease of the Bone. *Radiology*, 1945, 44: 449.

This study is an analysis of data on 367 patients seen at the Mayo Clinic prior to January, 1938, for whom there had been a diagnosis of osteitis deformans.

This condition was encountered in only 1 case in which the patient was less than thirty years of age. The highest incidence of the disease occurred during the sixth decade of life, one-third of the patients falling into this group.

A definite familial incidence was observed, 16 of the patients having 21 relatives who had the same disease.

Seventy-five patients (20 per cent) did not make any complaints prior to the time of diagnosis; they had not been aware of anything unusual as far as the osteitis deformans was concerned. The presence of the disease was discovered incidentally in the course of a roentgenographic investigation.

On the basis of the variation of the roentgenological manifestation of osteitis deformans, the roentgenograms in 200 cases have been classified into two phases: (1) sclerotic phase, and (2) combined phase, with 100 cases representing each type.

The most striking alteration observed in the blood of patients who have osteitis deformans is an elevation of the serum phosphatase. Higher levels for the serum phosphatase were observed in those cases classified roentgenographically in the combined phase of the disease rather than in those in the sclerotic phase.

Pathological fracture is one of the most common complications of osteitis deformans. Seventy-seven pathological fractures were encountered among 62 of the patients included in this series. Pathological fracture is most likely to occur in the cases in which the condition is classified roentgenographically in the combined phase, and, nearly always, healing with abundant callus takes place in this group.

In 3 of the cases, sarcoma, and in 1 case, benign giant-celled tumor, were complicating factors of the disease. In each instance the tumor developed among patients suffering from the polyostotic form of the disease.

Localized or diffuse areas of finely mottled osteoporosis of the skull are thought to be an early roentgenographic manifestation of the disease. This condition may be associated with diffuse zones of osteoporosis or minute opacities. In some instances the mottled osteoporosis may be only roentgenographic evidence of the disease in the skull.

In a study of 117 cases in which there was involvement of the skull, 26 cases of osteoporosis circumscripta were encountered. Twenty-one of these 26 patients had associated osteitis deformans elsewhere in the skeleton. Subsequent roentgenological examination in some instances demonstrated multiple shadows of increased density typical of osteitis deformans, these appeared in the sharply defined areas of osteoporosis. From the observations in this study it would seem that osteoporosis circumscripta is an early roentgenographic manifestation or precursor of osteitis deformans of the skull.

In a review of the older publications on the subject it was found that the authors held the view that the skull and tibia were the most frequent sites of the disease. However, in the study of this series of cases, it was demonstrated that the most frequent site of the disease is the pelvis, it being involved in 243 of the cases. This high incidence of involvement of the pelvis may be partially accounted for by the frequency with which the diagnosis was made incidentally during the course of an urologic examination.

Russo, P. E., and Shryock, L. F.: Bone Lesions of Congenital Syphilis in Infants and Adolescents; Report of 46 Cases. *Radiology*, 1945, 44: 477.

Syphilitic infants who show bone lesions do so in the first four months of life. These lesions tend to regress or heal spontaneously later in life. Osseous changes have been found in the long bones of fetuses as early as the fifth month of gestation, which makes the diagnosis of congenital syphilis possible. Prenatal antisyphilitic treatment does not assure the mother that her baby will not have syphilis. The highest incidence of congenital syphilis, however, has been observed in cases in which no treatment was administered.

Bone lesions caused by congenital syphilis can be accurately diagnosed by roentgenography. Biopsy and microscopic examinations do not offer any advantage.

In children younger than one year, osteochondritis is the condition most frequently found. Some cases show a "zig-zag" or "sawtooth" appearance of the metaphysis, with or without formation of a sclerotic zone or cup. In some instances the destruction is so extensive that metaphyseal fractures develop (Parrot's pseudoparalysis).

Syphilitic periostitis is found at any age, alone or in association with other bony changes. In some cases it has the appearance of a thin linear shadow. Occasionally many layers overlap and have an onion-skin appearance often sharply broken off to imitate a Codman's triangle. This type has often been diagnosed as a primary bone tumor.

In older syphilitic children osteomyelitis is more prevalent. The bone has been replaced by syphilitic granulation tissue.

Luetic osteitis is found exclusively in the older child. The anterior aspect of the tibia is affected in

most cases; it shows anterior bowing and thickening. This condition is known as "saber shin." Often areas of destruction are observed in the thickened portion and these respond very well to antiluetic therapy. Surgical intervention is contraindicated.

Syphilis rarely involves a single bone. In the diagnosis of a luetic bone lesion, serological tests and roentgenograms of the entire skelton should be made.

The author reviewed the bone lesions of 46 luetic children, and presents the roentgenographic views and histories of 6 cases. GEORGE I. REISS, M.D.

Wood, H., Quinlan, J. W., and Merrill, E. F.: Multiple Myeloma in a Youth. *Am. J. Roentg.*, 1945, 53: 466.

The authors report a case of multiple myeloma which occurred in a boy nineteen years of age. This case is interesting because of the rarity of multiple myeloma during youth.

The patient was admitted to the Medical Service of the United States Naval Hospital at Newport, Rhode Island, on May 24, 1943, complaining of backache, which resulted from an injury in a football game a week before. Roentgen examination made the day prior to admission revealed a fracture of the body of the seventh thoracic vertebra. On admission the only positive clinical finding was an area of tenderness over the seventh thoracic vertebra. The neurological examination remained negative.

Additional roentgenograms made on May 26 and 28 showed multiple areas of decreased density in all of the ribs, both scapulæ, both clavicles, some of the vertebrae of the thoracic spine, both innominate bones, ends of both femora, and in the skull. Numerous laboratory tests, which are given in detail, failed to reveal any data of diagnostic significance.

On June 13 a biopsy was taken from the eighth rib in the anterior axillary line. Parts of tissue obtained were sent to 4 different pathologists. There was rather close agreement that the tumor was a primitive atypical myeloma, but there was some uncertainty as to the cytogenesis of the tumor, that is, whether it developed from the plasma cell or from the granulocytic series of marrow cells.

On July 5 the patient was transferred to the United States Naval Hospital at Brooklyn, New York, for palliative roentgen therapy.

The last report is dated September 22, 1943, when there was extensive and uncontrollable disease involving almost the entire skeletal system.

T. LEUCUTIA, M.D.

Ficarra, B. J., and Adams, R.: Postoperative Gouty Arthritis. *Arch. Surg.*, 1945, 50: 229.

Five patients with gouty arthritis following major surgical procedures were observed. Four had cancer, 3 of these, gastric cancer. Every patient was a man over fifty-five years of age. Each one had some degree of osteoarthritis.

Manifestations referable to the joints usually occurred within five days after the operation. The joint of the large toe was the site most frequently involved. Spontaneous remission without residual articular distress occurred.

Determinations of blood chemistry indicated a true hypoproteinemia in 4 patients, a determination not being made for 1 patient. Hyperuricemia of variable degree was recorded in all 5 patients.

The postulated mechanism for postoperative gouty arthritis is the stimulation of the endogenous purine metabolism by hypoproteinemia, which results in hyperuricemia. This causes precipitation and the formation of tophi on an osteoarthritic joint.

This study accentuates the value of an adequate intake of protein for surgical patients. The correction of the hypoproteinemia results in a disappearance of the articular symptoms.

The facility with which protein depletion occurs can be appreciated when one considers that a surgical patient usually is given a diet with little or no protein. This may be the fault of the surgeon, who may limit the preoperative diet, especially when surgical procedures on the gastrointestinal tract are contemplated. The patient's poor appetite may be another contributing factor.

During the postoperative period the disturbance may not be corrected. Usually only a liquid diet is permitted for several postoperative days. When the patient does not eat or when vomiting occurs, protein starvation is further increased because the usual intravenous medicaments contain only dextrose and isotonic solution of sodium chloride. This protein deficiency is the fundamental basis for the development of postoperative gouty arthritis. Therefore, the appearance of gouty arthritis in a surgical patient should suggest a more serious metabolic discord than superficial examination would indicate. Although serious, this complication can be easily rectified by the establishment of a positive blood-protein balance. ROBERT P. MONTGOMERY, M.D.

Waine, H., Bennett, G. A., and Bauer, W.: Joint Disease Associated with Acromegaly. *Am. J. M. Sc.*, 1945, 209: 671.

Erdheim directed attention to the relationship of pituitary tumor and specific articular changes for the first time. The joint lesions in long-standing acromegaly very often are indistinguishable from degenerative arthritic changes.

A fifty-eight year-old patient suffering from acromegaly died of bacterial endocarditis, and a careful study of the joint changes was made by the authors.

In the expanded rib cartilage and in one toe joint, changes were observed which indicated reactivated cartilage growth and endochondral ossification. These findings are unphysiologic at the age of the patient and could have been the result of increased hormonal activity. The other changes found in the spine, knee, and shoulder joints were similar to degenerative changes often seen in nonacromegalic individuals.

A detailed account of the postmortem examination, and photographs illustrating macroscopic and

microscopic findings are included in this article.

GEORGE I. REISS, M.D.

Steinsleger, M., and Slullitel, J.: Angiomas of Muscle (Angiomas musculares). *Rev. ortop. traumat.*, B.-Air., 1944, 14: 152.

Six cases of muscle angioma are described and illustrated with photographs and photomicrographs of the histological findings. Two angiomas were in the lower limb, and 2 on the back, 1 angioma was in the forearm, and 1 in the nape of the neck. These tumors generally begin early in life. Three of the authors' patients were children.

These tumors occur most frequently in the muscles of the lower limbs. Davis and Kitlowsky collected 212 cases in 1930 and Jenkins and Delaney collected 256 in 1932. Weaver, in his statistics on 137 cases, found a definite congenital origin in 13.4 per cent and a history of trauma in 21.1 per cent. There was a history of trauma in only 1 of the authors' cases.

Angiomas of muscle are generally benign but cases have been reported in which they underwent malignant degeneration. Pain occurs in the majority of cases, especially in the lower limbs, and is probably due to pressure on nerve filaments in the region. Deformity is frequent. In 1 of the authors' cases there was irreducible equinus.

Generally the diagnosis is made on operation, but there are symptoms which indicate the diagnosis. Often there are many telangiectases of the skin; the tumors generally begin in infancy or early childhood and phleboliths can often be found on palpation. The pain and deformity are characteristic. Roentgen examination shows phleboliths.

The prognosis in general is good. When the tumor is limited to one or two muscles it can be removed surgically without danger of recurrence. If a large part of a muscle is involved it should be removed surgically even though this involves some loss of function which must be corrected later. In diffuse angiomas surgery is a very serious matter and should be considered carefully. If the tumor has no serious functional effects and the patient can walk it is better not to operate. Severe hemorrhage is frequent in these cases. In 1 of the authors' cases operation was insufficient, for only parts of the gemelli were removed, without removal of the soleus which was also greatly affected. In 1 case a sclerosing treatment with quinine sulfate was used, but recovery was complicated and very much delayed by suppuration. Surgery is to be preferred to this treatment. The authors have not had any experience with roentgen or radium therapy, but according to reports the results are not good.

AUDREY G. MORGAN, M.D.

Boutrous, T. A., Blain, A., III, and Chipman, W. A.: Nonsplinting Treatment of Elbow-Joint Injuries. A Report of Its Use in 20 Cases. *Am. J. Surg.*, 1945, 68: 212.

In only 4 of a series of 20 cases of injuries of the elbow joint, temporary immobilization was employed. In these 4 cases the periods of immobilization averaged six and three-fourths days. This average is too high, however, because of an oversight in 1 case in which the mold was left on inadvertently for thirteen days.

In the 12 cases in which there was little or no displacement of the fragments, nonsplinting with the triangular sling was used exclusively with excellent results. In addition to these 12 cases, 5 cases of Neuwrith's are cited.

In the 8 cases in which the fractures were more complex, open reduction was necessary in 2 and temporary splinting in 4. However, the principles of early active and passive motion were employed in all of the cases with results which the authors consider to be superior to those obtained by the older method. In all cases eventual function of the elbow joint was excellent, and in all cases a triangular sling was used. Pronation and supination are the functions which return first. Flexion is next and extension returns last.

The nonsplinting method in fractures and epiphyseal injuries about the elbow joint without displacement of fragments has been found to be the method of choice.

In fractures requiring reduction, occasional splinting was desired for rather brief periods of time (usually under one week).

It is recommended that the nonsplinting method of treating fractures and injuries about the elbow joint be more widely employed and the results studied. However, the authors caution against the indiscriminate use of the nonsplinting method in the complicated cases requiring reduction.

ROBERT P. MONTGOMERY, M.D.

Gray, H.: Arachnodactyly (Spider Fingers). *Arch. Int. M.*, 1945, 75: 215.

Arachnodactyly is a developmental anomaly characterized by long and slender bones found in all four extremities. Very often other congenital anomalies are associated, i.e. dislocation of the lens of the eye, cardiac defects, and feeblemindedness. Four cases of arachnodactyly are discussed and added to the 200 cases already reported in the literature.

The author points out that in the past no standard procedure was followed in the description of this anomaly. Therefore, it was difficult for the reader to evaluate the findings and to use them for comparison. In this article an attempt is made to follow certain lines computed and outlined by the author in previous articles. One case is described in detail and the 3 others are only mentioned.

A ten-year-old son of a Dalmatian mother and a Portuguese father had shown no abnormalities as to pregnancy and birth. The nurses, however, had noticed his unusually long hands, feet, and ears, and named him "Infant Hercules." At the age of one his difficulty in seeing was noticed. At the age of five he had to have special shoes because of the extreme narrowness of his feet.

The examination including anthropological measurements among other methods showed the boy to be of average and normal intelligence. There was some weakness of the muscles of the upper and lower arms, thighs, and legs. The biceps and triceps reflexes were absent. There was miosis and iridodonesis, which very often are associated with arachnodactyly. A systolic murmur was found and two "extra sounds" were heard over the apex. The weight was normal for the boy's age. He was 13 cm. taller than the average. The pelvis was extremely wide and corresponded to a pelvis of an average female from seventeen and one-half to eighteen and one-half years old. The genitalia were normal. The shoulder breadth was narrower than average. There was microcephaly. Partial gigantism was found in the upper extremities which became more pronounced distally. The reverse was true for the lower extremities. No explanation was offered.

GEORGE I. REISS, M.D.

Key, J. A.: Intervertebral-Disk Lesions are the Most Common Cause of Low Back Pain with or without Sciatica. *Ann. Surg.*, 1945, 121: 534.

The author states that so-called idiopathic low back pain with or without sciatic radiation is the most frequent condition seen in the adult orthopedic clinic. Twenty years previously, after studying a series of 300 patients whose principal complaint was low back pain or sciatica, the author concluded that the great majority of these patients were suffering from strains of the lumbosacral or sacroiliac joints. The lumbosacral strains were found to outnumber the sacroiliac strains by more than 4 to 1. At that time the author stated that, although the pathological change was not known, it was suspected that the lesions of traumatic and gradual lumbosacral strains were true sprains with tearing or stretching of the ligaments or joint capsules, and that the referred pains were due to irritation of the nerve roots by synovitis or exudate in the adjacent joints.

The author notes that the reason orthopedic surgeons had not discovered disk protrusions long ago is that they had done little or no work in the spinal canal and did not appreciate the significance of the fact that the nerve roots within the canal are exquisitely sensitive as compared with the peripheral nerves. Realization of this fact immediately focuses one's attention on an intraspinal cause when dealing with referred pain and it is found that a relatively slight lesion within the canal can cause severe symptoms. The protrusion of the disk was a satisfactory explanation of the symptoms in patients with the typical disk syndrome.

A lesion of an intervertebral disk is, also, a frequent cause of low back pain that becomes localized in the low back or at times is felt in the buttocks, thigh, leg, or foot. Both traumatic and postural types of low back pain originate in the lumbosacral area, may be of sudden or gradual onset, and begin with or without known cause. In the traumatic type the pain is predominantly unilateral and also tends to be referred to the buttocks, posterior thigh, calf, and even to the toes. In the postural type the pain is in the midline and bilateral in the lumbosacral region and tends not to be referred.

The physical findings in these patients vary directly with the severity of the symptoms present at the time of examination. All transitions between the patient with a complaint of mild unilateral low back pain who is completely negative on physical examination and the patient with a typical disk syndrome with severe back and sciatic pain, marked muscle spasm and pain on movement, limitation of movement of the back and lower extremities, and sensory and reflex changes in the involved lower extremity, may be found. The symptoms may vary greatly from time to time, which makes it possible to trace the various transition stages between the mild unilateral low back pain and the typical disk syndrome in a single patient if he is studied over a period of time and his symptoms become aggravated or subside during the period of observation. In all of these traumatic types of lumbosacral strains, a disk lesion is the most logical explanation of the dramatic relief obtained at times by manipulation of the low back.

On physical examination of patients with the postural type of lumbosacral strain, they exhibit tenderness on pressure in the lumbosacral region and the pain is aggravated by hyperextension of the low back. In most instances the patients do well under conservative treatment. In an occasional patient with a lumbosacral strain of the postural type, operative treatment is advisable, and in about 25 instances, the author removed disks which protruded in the midline and in most of these the operation was followed by relief of the pain.

The author believes that in practically all patients with idiopathic low back pain the cause is within the spinal canal and in over 90 per cent of the cases, this is a lesion of the intervertebral disk. In mild cases, the back probably originates in the disk itself. It is possible that some of the back pain is due to irritation of the nerve roots and is referred along the posterior primary division of the involved spinal nerve.

The problem of diagnosis is to determine whether or not the pain originates in the low back. If pain in the low back is the dominant symptom, the pain is rarely caused by genitourinary or pelvic disease. If the pain is in the lumbosacral region and this area is tender on deep pressure, and if the pain is aggravated by certain movements of the low back or lower extremities, it originates in the low back. It may be due to a destructive disease of the bone, which can be diagnosed roentgenologically. These cases comprise less than 10 per cent of the total number of cases of low back pain. It is the opinion of the author that in the other 90 per cent the lesion is intraspinal in origin and due to a lesion of the intervertebral disk. In about 10 per cent of these patients an operation is the treatment of choice. In the majority, the pain either subsides spontaneously or yields to conservative treatment, and in the remainder the pain and disability are not sufficient to warrant operation.

The fact that some patients continue to have pain after the operation can be explained by (1) incomplete removal of the offending disk; (2) removal of the wrong disk or of only one disk when two or more are causing symptoms; (3) recurrence or protrusion of more disk material from the offending disk; (4) later protrusion of a neighboring disk; (5) the presence of a ridge of bone at the margin of the offending disk; (6) adhesions following the operation; (7) arachnoiditis or nerve damage from pressure by the disk; and (8) a tumor may have been missed. Many of these unrelieved cases should be operated upon a second time and a hemilaminectomy should be performed, if necessary, and the lower lumbar canal should be explored thoroughly. The author has abandoned spinal fusion as a cure for idiopathic low back pain after unsuccessful disk operations. The relief sometimes obtained by the so-called decompression operations may be due to the careful liberation of the nerve roots rather than to decompression.

HERBERT F. THURSTON, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Jaekle, R. F.: Internal Derangements of the Knee Joint. *Arch. Surg.*, 1945, 50: 271.

This article reports a consecutive series of 190 arthrotomies of the knee joint done on military personnel in the Station Hospital, Camp Roberts, California, within a two-year period. The patients operated on were, in one sense, selected, because operation was not advised or done if it appeared that the patient was unstable and had not the will to get well.

In all cases the patient was taught exercises for the quadriceps muscle before the operation and was impressed with the idea that his co-operation was the deciding factor in a successful operation. In cases in which the patient exercises well after operation, the normal physiological action is maintained and he does not suffer weakness and relaxation of the knee.

The surgeon should not be content with simple inspection of the opened joint. Gentle traction on the cartilage or exploration with a blunt hook usually demonstrates a posterior tear. Mistaken diagnoses will be made in any series of cases. In 6 cases of the present series there was no tear of the cartilage but the patients had hypertrophic fat pads which required excision. The short straight parapatellar incision was used and provided good exposure. In 3 cases, bucket-handle tears of both medial and lateral menisci in the same knee were removed easily through one incision. If the lower pole of the incision did not sever the inferior medial articularis genu artery, there was much less postoperative swelling of the knee.

In the repair of bucket-handle tears, the torn portion was removed and the border of the remaining portion was cleanly excised without removal of the entire cartilage. For other types of tears, most of the meniscus was removed, but a small rim was left.

In 2 cases torn cartilages in both knees were removed at one operation. The patients recovered as quickly and as perfectly as the average patient who has had only one knee operated on.

The postoperative care of patients with such injuries in former years was too prolonged. Recent reports emphasize the need for exercises of the muscles before and after surgical intervention, but, in addition, it is essential that the patient begin early weight-bearing, except if there is initial severe hemorrhage and significant reaction. In many cases of this series there was no form of immobilization used, but for patients with noticeable swelling and sanguineous joint fluid a dressing of cotton wadding and resilient bandage was applied for two to five days.

In the cases of early injury, splinting was routinely carried out for five days, and weight-bearing was permitted after seven days. It is not logical to use an identical procedure in all cases.

There is no contraindication to early walking except that of discomfort caused by the incision.

With the patient walking earlier, the return of function is facilitated. The period required for return to regular duty is generally the same, because three weeks is considered soon enough for the patient to do all the physical exercises required during training. Three of the patients were in the Medical Department, not on field duty, and were allowed to return to work at their own request as early as nine and eleven days, respectively, after the operation. They had full motion of the limb and no soreness, swelling, or instability.

As far as this study can determine, age is no factor within the age limits of the patients that have been operated on, namely, eighteen to forty-two years. The men over thirty were more stable and worked harder with the single purpose of rehabilitation, and all secured good stable knees and had no complaints.

So many patients with several recurrences of symptoms have shown from moderate to extreme erosion of the femoral condyle and arthritic changes within four or five years after injury, that the strong impression remains that conservative treatment for any one doing physical work is a mistake. Surgical intervention is recommended within a short time after injury, when the acute phase has receded, and without delay in cases of the bucket-handle tear that is not reduced by manipulation.

The hypertrophic fat tab is easily located, and it is necessary only to bear in mind the possibility of its being present, so that normal cartilages are not removed and so that pathological conditions may not remain. These cases definitely present more of a problem of convalescence than cases of torn cartilage. Despite closure of the defect remaining in the infrapatellar fat pad after excision of the hypertrophied portion, there is more reaction of swelling, soreness, and synovitis after operation. Functional return is slower.

The operative results in a consecutive series of 155 cases of torn semilunar cartilages are analyzed.

ROBERT P. MONTGOMERY, M.D.

FRACTURES AND DISLOCATIONS

Hinchey, J. J., and Bickel, W. H.: Fracture of the Atlas. *Ann. Surg.*, 1945, 121: 826.

Fractures of the atlas are notable as regards their apparent rarity and their comparatively favorable prognosis. Hatchette noted 99 cases reported up to 1941 and added 1 of his own. Crooks and Birkett have since reported 4 cases, and 8 cases have been encountered at the Mayo Clinic, which brings the total to 112. The mortality rate of 10.7 per cent in the cases reviewed to date establishes this entity as dangerous but by no means necessarily fatal.

Clinical signs are scarce in cases of isolated fracture of the atlas. Ordinarily they consist in pain and stiffness of the neck with tenderness, especially in the suboccipital area. Motions are usually limited and slowly performed, although there may be instability which causes the patient to hold his head with his hands. Occasionally the patient may complain of tingling and pain in the arms and legs despite the absence of neurological findings. Swallowing may be painful or impaired because of retropharyngeal hemorrhage, particularly in cases of fracture of the anterior arch. Involvement of the greater occipital nerve may produce neuralgia over its area of distribution. Injury to a vertebral artery occurs in rare instances.

Treatment of fractures of the atlas has become fairly well standardized and good results have been obtained with most of the means used. From 4 to 6 pounds (1.8 to 2.7 kgm.) of head traction in bed in straight extension are usually sufficient for immediate relief of the symptoms, although occasionally more are needed. A Sayre sling will suffice for this. Relaxation of the neck muscles is quickly obtained, and in a few days a plaster cast or a leather collar may be applied to immobilize the neck. Should the fracture be complicated by a tendency to subluxate, the traction may have to be continued for three or four weeks before the use of a collar. From six to eight weeks after uncomplicated injury the patient is re-examined and new roentgenograms are taken. The collar is discarded at any time after from eight weeks to four months, according to the progress of the patient and the roentgenographic findings. After removal of the collar, return of function is materially aided by physical therapy. Stiffness and limited motion of the neck are stubborn residua of such injuries. Although it may require some months, ultimate return of function is almost always complete. When the condition is complicated by greater occipital neuralgia, however, persistent pain may require surgical intervention. Lack of callus formation is characteristic, delayed or incomplete union occurring regularly, and nonunion occurs frequently.

In 3 cases the results were classed as excellent, in 2 as good, in 2 as fair, and in 1 case as poor. These fractures rarely unite, but there is usually no ultimate disability, although stiffness and limited motion of the neck may sometimes persist for several months.

Goldenberg, R. R.: Closed Manipulation for the Reduction of the Neck of the Radius in Children. *J. Bone Surg.*, 1945, 27: 267.

The author describes the Patterson manipulation for reduction of fractures of the neck of the radius in children and cites 4 cases in which satisfactory results were obtained by this method.

In the Patterson manipulation the elbow is extended and the forearm supinated. Strong distal traction is maintained on the supinated forearm and with firm lateral pressure against the medial humeral condyle the forearm is forced medially until the carrying angle is reversed; this opens the lateral joint space. The displaced fragment is then manually replaced.

The manipulation is performed under general anesthesia. Reduction is complete when the articular surfaces of the radius and capitellum are parallel as seen by means of x-rays. The extremity is immobilized in plaster for three weeks with the elbow held in 90 degrees of flexion and the forearm in complete supination.

In the 4 cases treated by this method excellent results were obtained and good range of motion ensued. The author recommends that this conservative treatment be tried in all similar cases before surgery is undertaken.

DANIEL H. LEVINTHAL, M.D

ORTHOPEDICS IN GENERAL

Brainerd, H., Katz, H. J., Rowe, A. P., Jr., and Geiger, J. C.: Poliomyelitis. *J. Am. M. Ass.*, 1945, 128: 718.

In reviewing the three cardinal symptoms described by Kenny, namely, muscle spasm, mental alienation, and inco-ordination, the authors refer to the findings of Mildaver, Schwartz and Bouman, and Watkins, Brazier, and Schwab. Neuromuscular degeneration was present in all muscles considered "alienated." Muscle spasm is a complex phenomenon produced by three factors: (1) meningeal irritation, (2) enhanced stretch reflexes of muscles opposed to muscles exhibiting neuromuscular degeneration, and (3) irritative lesions of posterior ganglions and posterior horn cells. Action currents suggested spasm in all muscles except those completely paralyzed. Clinical spasm was often not apparent, especially in weak muscles. Increased action potentials were found in the resting state in all muscles involved, whether in spasm or not, especially after a three-month recovery period. These observers believed that this was evidence of recovery of innervation. These investigators also noted simultaneous action currents to both of two opposing muscles in patients recovering from poliomyelitis which possibly accounted for the inco-ordination.

The authors report on 100 cases of acute poliomyelitis, attempting to estimate the efficacy of neostigmine, hot fomentations, and muscle re-education.

All cases exhibited spasm in the form of a hyperirritable stretch reflex producing limited movement.

The muscles most frequently involved were the posterior cervical, back, and hamstring. While these are the muscle groups in which irritability to stretch stimulation is commonly attributed to meningeal irritation, such is not the case in poliomyelitis, since these symptoms often persist many months after all possibility of meningeal irritation has passed, and also because the spinal fluid was found normal in a significant number of cases.

Muscle weakness was observed in 48 cases. Weak muscles often developed atrophy while under treatment. Motor power generally returned gradually during re-education.

Inco-ordination was observed frequently in patients with weak quadriceps who, on being asked to extend the knee, would visibly contract the hamstrings.

Of 28 early cases in which one-hour tests were done after the injection of neostigmine, 24 (85 per cent) showed a significant degree of muscle relaxation. Measurements of improved ranges of motion were made with the goniometer. Motor power was estimated by clinical examination.

The authors conclude that the value of continued medication with neostigmine, orally or subcutaneously, requires further proof, but its further trial under controlled circumstances is definitely warranted.

The authors state that the Kenny treatment with or without neostigmine is an effective method of preventing contracture and deformity.

The study gave no proof that either neostigmine or Kenny packs reduce the incidence of paralysis.

DANIEL H. LEVINTHAL, M.D.

Fox, M. J., and Spankus, W. H.: Neostigmine in Poliomyelitis. *J. Am. M. Ass.*, 1945, 128: 720.

This study was based on the treatment of 24 cases of acute anterior poliomyelitis in patients from three to fifty-five years old. Neostigmine was given subcutaneously and orally. A control group of 6 cases did not receive neostigmine. All of the cases were given Kenny hot fomentation treatments. The results apparently did not lead to definite conclusions, but the authors thought that the combined use of neostigmine and hot fomentations resulted in persistent and perceptible relaxation of the muscle spasm.

DANIEL H. LEVINTHAL, M.D.

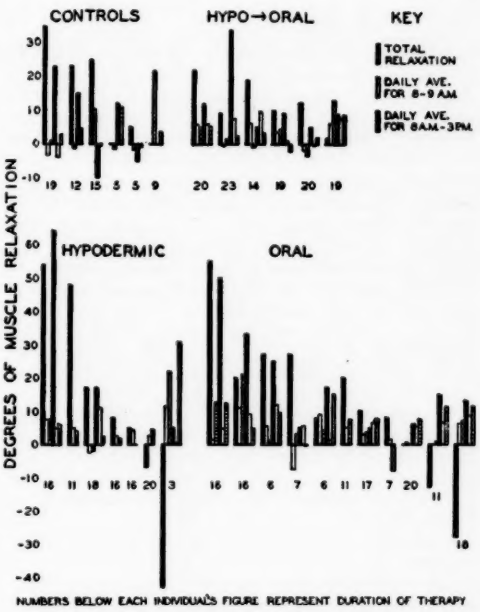

Chart 1. Effect of neostigmine on muscle spasm: relaxation reported for right and left hamstrings or gluteal muscles for each patient.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Sellors, T. H.: Surgery of Persistent Ductus Arteriosus. *Lancet*, Lond., 1945, 248: 615.

The author states that the first successful case in which a patent ductus arteriosus was occluded by surgery was recorded in 1939. A number of successful cases have been recorded since that time. Surgery can be used only in those cases of patency in which the occlusion would not bring about any detriment to the circulatory system. It can be of great benefit to patients who are suffering from ill effects attributable to the abnormality, and it must be decided what circumstances and complications constitute an indication for interference.

A persistent ductus is an arteriovenous fistula through which the pulmonary and systemic circulations can come in contact. The direction of any blood stream through the ductus is from the high pressure of the aorta into the lower tension of the pulmonary circulation, with the result that such swirls and eddies as occur make their maximum turbulence on the pulmonary side of the fistula. Extensive dilatation of the pulmonary conus develops and the main pulmonary trunks with the whole of the vascular bed of the lungs become enlarged. If there is any circulatory disability it will depend on the proportion of the systemic blood that is "shunted" through the ductus. Infection in the form of subacute bacterial endocarditis with streptococcus viridans as the causative organism accounts for a high percentage of deaths. Abbott gives the figures as 37.5 per cent of the uncomplicated cases in which the patients have survived the first five years of life.

Subacute endocarditis which occurs in the presence of a patent ductus is a definite indication for early surgery, and this is even more emphatic if there is any failure of response to chemotherapy. In long-standing infection in which vegetations may have extended beyond the pulmonary area, the chances of cure are reduced, but ligature accompanied by chemotherapy may lead to ultimate sterilization even after the interval of a year. Early operation in all cases of infection is fully justified. In cases of persistent ductus, the average expectation of life is between twenty and twenty-five years. Tachycardia and exaggerated pulsation, which may be severe enough to shake the whole body, are conditions which demand the consideration of surgery. The reasons for surgery in a symptomless case are largely prophylactic; closure of the ductus, as far as is known, will prevent the occurrence of heart failure and infection. Against this must be balanced the risk of operation.

The reason for continued patency of the ductus arteriosus is a matter for conjecture. The intrathoracic "negative" pressure occurring with the first breath of life, sudden changes in aortic and pulmonary pressures, and temporary lowering of the systemic tension when the placental circulation has been excluded have been advanced as possible reasons for the closure. The anatomical relations of the ductus with the aortic arch is a factor which should be considered. If the ductus is placed so that the angle formed between it and the aortic arch is acute, the flush of blood through the aorta tends to sweep past the ductus opening. If the ductus lies less acutely, the rush of blood may impinge on the mouth of the ductus and maintain its opening.

The surgical technique of closure is described in detail. Ten case reports are presented.

Occasionally an apical systolic murmur persists. The exaggerated pulmonary vascular markings disappear slowly, as also does the enlarged pulmonary conus. Multiple fluffy patches produced by infarction in infected cases clear quite rapidly and disappear within two or three weeks. Signs of turbulence or vascular fistulas are immediately reduced, but may not disappear completely for several months. There have been recorded instances of recurrence of the typical patent ductus murmur and thrill. This has usually resulted from the ligatures cutting through with re-establishment of the fistula through a false vascular channel. The choice of ligature material and method of ligation have not been finally settled. In infected cases, persistence of fever or any suggestion of embolism is an indication for a full course of chemotherapy to deal with vegetations which have arisen in sites other than near the ductus.

In concluding, the author notes that patients with an uncomplicated patent ductus arteriosus run the risk of subacute bacterial endocarditis and heart failure. Ligature of this channel can provide striking relief in a high proportion of cases. An absolute indication for ligature is early infection. It is a reasonable procedure in cases which show signs of commencing heart failure.

HERBERT F. THURSTON, M.D.

Pendergrass, R. C.: Cardiac Changes in Arteriovenous Fistula. *Am. J. Roentg.*, 1945, 53: 423.

The author states that one of the most frequent and serious vascular injuries of modern warfare is arteriovenous fistula. The effects of an arteriovenous fistula upon the circulation in general, and upon the heart in particular, are so important that the attention of roentgenologists should be called to the cardiac changes incident to this lesion. As these changes are usually reversible by elimination of the fistula, it is important that their cause be recognized. The heart changes of beriberi, myxedema, and hyperthyroidism are to some extent reversible. Constrictive pericarditis and patent ductus arteriosus offer brilliant examples of the beneficial effect of surgery; the improvement following surgical elimination of an arteriovenous

fistula is equally dramatic. Any patient exhibiting cardiac enlargement without obvious cause, and who has received battle injuries, should be carefully examined for an arteriovenous fistula. This includes auscultation of all wounds.

McGuire and his associates demonstrated the following changes associated with the establishment of a large arteriovenous fistula: (a) fall in the mean arterial blood pressure and acceleration of the pulse; (b) increase in the cardiac output and stroke volume; (c) elevation of the venous pressure distal to the fistula, but little change in the venous pressure proximal to the fistula; and (d) acceleration of the velocity of the blood flow proximal to the fistula.

Thirty-two cases of arteriovenous fistula have been studied roentgenographically with respect to cardiac measurements before and after surgical elimination of the fistula. These studies are directed toward the investigation of (1) the detection of cardiac enlargement, (2) the effect of temporary manual obliteration of the fistula, (3) study of the immediate postoperative changes, and (4) the eventual changes in cardiac size following operative elimination of the fistula. The measurement of cardiac size was based on the sum of the right and left transverse cardiac diameters on roentgenograms taken at 72 inches in full inspiration, with 150 ma. and 1/10 second.

The most striking fact which evolved from studies on the existence of cardiac enlargement in arteriovenous fistula was that many cases showing normal cardiothoracic ratios and no abnormality of cardiac outline exhibited a definite decrease in cardiac measurements after surgical elimination of the fistula. The cardiac enlargement was not evident when commonly accepted standards were applied, but only became evident when the postoperative were compared with the preoperative roentgenograms. This indicates that while the cardiac changes in arteriovenous fistula may be early and dramatic in some cases, they are late and insidious in others. In patients having true or false arterial aneurysms and cirsoid aneurysms, no cardiac changes were demonstrated on the roentgenograms. Congestion of the pulmonary vessels was noted in a few instances and this improved after operation.

Twenty-three cases were examined before and during manual obliteration of the fistula. Compression was applied until the bruit was obliterated and the pulse slowed. There is no appreciable change in cardiac size resulting from temporary occlusion of the fistula. Roentgenoscopically, the heart could be seen to slow its rate and increase the amplitude of its contractions.

While there was considerable variation in the time of appearance and the extent of measurable increase and decrease of the transverse cardiac diameter, the tendency was toward an increase in the first two hours after operation, with a decrease beginning at twenty-four hours, which continued to the seventh day after operation.

The following factors are believed to contribute to the variation in cardiac size immediately following surgical closure of the fistula: the size and duration of the fistula, the proximity of the fistula to the heart, the degree of dilatation of the proximal vessels, and the extent to which the myocardium is able to respond to the sudden circulatory changes.

A group of 32 patients were examined at intervals varying from fourteen days to six months after surgical elimination of the arteriovenous fistula. Twenty-seven patients showed an average decrease in cardiac diameter of 1.18 cm.; 1 patient showed an increase; and 4 patients showed no change.

HERBERT F. THURSTON, M.D.

Kidd, H. A.: Suture of Laceration of the Inferior Vena Cava Due to Bomb Splinter. *Brit. J. Surg.*, 1945, 32: 508.

The author states that injuries of the inferior vena cava may be due to (1) penetrating wounds; (2) external violence without penetration; and (3) injury during surgical operations. A number of cases due to the last cause have been recorded, but recovery from hemorrhage due to the first two is uncommon. This is due to the time factor and to the presence of other abdominal lesions which may of themselves prove fatal. A case record is given in detail in which the patient recovered after a penetrating wound from flying bomb fragments.

Nine cases of recovery following injury to the inferior vena cava have been recorded. Ligation is only practicable below the entrance of the renal veins, but in no case after ligature did edema of the legs persist. When time is of importance, the simpler procedure of ligature of the vena cava may be safely used.

Interesting features of the cases due to external violence or penetrating wounds are the lapse of time between the injury and operation, and the operative findings, which reveal that in the large majority only a relatively small amount of hemorrhage has occurred. It is not until the surgeon exposes the injured vena cava that there is profuse bleeding. Taylor suggests that this is due to the fact that the wounds in the vena cava and those in the overlying peritoneum are not superimposed, but it seems possible that the intra-abdominal pressure is also a factor, rigidity of the abdominal muscles being present and shock causing a considerable fall in the blood pressure.

When an abdomen has been opened before a retroperitoneal hemorrhage is explored, provision should be made for blood transfusion, adequate access to the site of injury, and good illumination, and the requisite suture materials should be prepared.

HERBERT F. THURSTON, M.D.

Anderson, F. M., and Patterson, R. H.: Phlebography and Treatment of Venous Thrombosis. *Northwest M.*, 1945, 44: 178.

The authors state that phlebothrombosis is the form of thrombosis that is of greatest danger, as it

may give little or no indication of its presence until it results in pulmonary embolism. Thrombophlebitis is the more inflammatory type, giving rise to pain, tenderness, edema, or elevation of temperature, pulse, or respiration. In its more serious form, thrombophlebitis causes the painful, swollen leg of classic phlegmasia alba dolens.

The thrombus usually originates in the venous plexuses of the calf of the leg. It may remain localized or take any of the following courses: (1) propagate up the femoral vein or even to the iliac vein or the vena cava, as a loosely attached soft thrombus is likely to break off at some point and result in pulmonary embolism of varying severity; (2) it may propagate in such manner as to fill the vein more completely and become adherent to its walls, with extension into tributary veins and reaction in the walls of the veins and the perivenous tissues. This results in more marked signs and symptoms, both locally and generally; in other words, a thrombophlebitis. It may go on farther and complete femoroiliac extension, with blocking of the vein and a marked increase in the inflammatory accompaniment, again the picture of phlegmasia alba dolens.

Soldiers, returning from overseas units, who had sufficient discomfort in the thigh or calf to incapacitate them for general military duty, showed readily evident venous obstruction or marked irregularity and tortuosity of the veins in the phlebogram. In these cases the authors found the usual clinical tests for patency of the deep veins to be uncertain or unreliable. The phlebography technique is described in detail.

Advantages of the phlebography technique are:

1. Veins need rarely be cut down upon and the procedure can, therefore, be readily repeated.
2. Two pictures of nearly all of the extremity are obtained.
3. The sometimes confusing superficial veins are usually not shown. If one wishes to include them the superficial veins, the tourniquet may be removed after the first picture.
4. If present, incompetencies in communicating veins will frequently be demonstrated.
5. The technique is a simple one, not requiring special equipment, and is quickly acquired by rapidly changing roentgen personnel.

Ten case reports are given in detail.

Heparin prolongs clotting by reducing the adhesiveness of the blood platelets. Dicumarol in proper dosage holds down the blood prothrombin level by inhibiting its formation in the liver, without delaying coagulation, and impairs clot retraction. Larger dosages prolong coagulation with serious danger of hemorrhage. The authors do not recommend the indiscriminate employment of larger doses in the prevention or treatment of venous thrombosis for the following reasons: (1) when thrombosis has already occurred, their administration does not give as rapid or as almost complete relief from pain as does ligation and section; (2) it is not generally accepted that they preclude the possibility of even fatal pulmonary embolism from an already formed thrombus; (3) they may be causative factors in serious or even fatal postoperative hemorrhage; (4) further propagation of thrombi may result after discontinuance of these medications; (5) the damaged venous channels are left in continuity and may result later in recurrent thrombophlebitis, especially if the patient is later bedridden by operation or other illness.

The Surgical Staff of the Letterman General Hospital, San Francisco, California, believe that vein ligation and section is certainly the procedure of choice in the case of any patient with venous thrombosis who has had a pulmonary embolism of any degree, who has an acute recurrence or flaring up of chronic venous thrombosis, who is over fifty, whether or not there has been a pulmonary embolism, or who develops thrombosis following one procedure of a multiple-stage operation.

In conclusion, the authors state that phlebography gives information that may be useful in determining the type of treatment for cases of chronic or recurrent venous thrombosis with their various complications, including varicose veins, chronic venous insufficiency, and postphlebitic or varicose ulcers. Obstruction of the deep venous trunks may persist for many years. In some of these cases, in which ordinary tests for patency are uncertain, phlebography provides definite information regarding the venous circulation. Phlebography reveals or clarifies occasional important congenital anomalies of the veins.

High venous ligation and section is the treatment choice for nearly all cases of acute or recurrent venous thrombosis. Phlebography is unnecessary as a preliminary to ligation in such cases when there are definite local clinical findings. In pulmonary embolism without clinical evidence of venous thrombosis, it may be used advantageously to determine the origin of the embolus. In cases of unilateral thrombosis, vein ligation of the apparently uninvolved extremity also should always be given careful consideration.

The milder the objective signs of venous thrombosis, the greater is the chance of embolism. Also, the more recently the thrombus has formed, the greater is the chance that a considerable portion break loose and be carried to the lungs. These facts show the hazard of waiting to see what will happen in case of mild or doubtful thrombosis.

HERBERT F. THURSTON, M.D.

Allen, A. W., Linton, R. R., and Donaldson, G. A.: Venous Thrombosis and Pulmonary Embolism. *J. Am. M. Ass.*, 1945, 128: 397.

Although the authors recognize the comparative safety as regards massive pulmonary embolism in true thrombophlebitis, they believe that, if recognized in the first few days of the process, the course of this disease can be altered by radical treatment.

They do not believe that interruption of the femoral vein has any place in the treatment of true thrombophlebitis after the seventh day of the disease unless infarcts have occurred. The earlier the diagnosis of phlebothrombosis or thrombophlebitis, with immediate bilateral interruption of the femoral vein, the shorter the period of disability. If operation is delayed until repeated infarcts have occurred or until swelling of the leg has existed for a week or more, the convalescence will be prolonged and the outcome doubtful.

Bilateral interruption of the femoral vein is a safe procedure which can be carried out on extremely ill patients and will prevent massive fatal pulmonary embolism. This operation should be performed (1) on patients who have developed nonfatal pulmonary embolism, even though no positive signs of venous thrombosis in the legs can be detected, and (2) on any patients who develop phlebitis, as evidenced by pain, tenderness, swelling in the lower extremities, dilated superficial veins, or pain in the calf muscles on forceful dorsislexion of the foot (Homans' sign). It is rare that all these signs are present, so that the decision to operate may depend on one or two criteria.

Except in rare instances, bilateral interruption of the femoral vein is indicated on all such patients, because in a number of cases thrombus formation has been found in the apparently normal unaffected extremity.

Interruption of the femoral vein has been used prophylactically without harm in a few elderly patients with intertrochanteric fractures of the hip, and in some requiring major abdominal surgery for cancer.

Every attempt should be made to make the diagnosis of thrombophlebitis before the femoral and iliac veins have become involved, since by early treatment the postoperative sequelae are reduced.

In cases with femoroiliac thrombosis, the mechanical removal of the thrombus from the vein by aspiration has been demonstrated to be a safe procedure. It should be done as early as possible after the thrombosis has been diagnosed. This reduces the pain and swelling in the leg and hastens the recovery, and prevents massive fatal pulmonary embolism.

In the group of 464 cases reported, no deaths have occurred as the result of femoral-vein interruption.

The authors conclude that the morbidity of thromboembolic disease is tremendously reduced by this operation.

The authors found that patients were apt to do well while heparinization was carried out, only to have a recurrence of their symptoms and signs after the heparin was stopped in from ten to fourteen days after this treatment was begun. The authors have found their method of treatment of great value if repeated minor infarcts had occurred after femoral-vein interruption. They also use it routinely after any arterial surgery.

Dicumarol has been used cautiously in a small number of cases. This method of treatment may become sufficiently standardized to warrant its more extensive use. At this time, however, it is not as safe nor as innocuous as femoral-vein interruption.

JOSEPH K. NARAT, M.D.

BLOOD; TRANSFUSION

Van Duyn, J., II.: Degenerative White Blood-Cell Picture As An Indication of Toxemia from Burns. *Arch. Surg.*, 1945, 50: 242.

The question regarding the presence of a specific toxemia in burns is not yet settled and there are at least six distinct attitudes to be found in the literature:

1. There is no true burn toxemia.
2. Infection can account for the whole picture of burn toxemia.
3. Hemoconcentration (secondary shock) can account for the whole picture of burn toxemia.
4. Burn toxemia cannot be explained solely on the basis of plasma loss and hemoconcentration.
5. Burn toxemia is a result of hepatic damage caused by anoxia, in turn a result of hemoconcentration and an impaired circulation.
6. There is a true burn toxin absorbed from the surface of the burn and responsible for burn toxemia.

The period of toxemia has been generally accepted as coming after secondary shock and before the onset of infection. Wilson has set the phases of burns more accurately as follows: (1) primary shock, up to two hours; (2) secondary shock, from two to twenty-four hours; (3) acute toxemia, from six to one hundred hours, and (4) septic toxemia, after one hundred hours.

Secondary shock and acute toxemia are difficult to separate clinically because secondary shock, whether treated or not, carries over into the toxic phase, and both may be affected by the presence of sepsis or other complications. In addition, while secondary shock is fairly constant and predictable, and can be estimated by the hematocrit, toxemia is erratic and uncertain, and there is yet no laboratory procedure to predict its development. Therefore the author undertook the study of the white blood-cell picture in 4 men burned by hot oil. He draws the following conclusions from his investigations:

There is an inhibitory effect on the leucopoietic system frequently demonstrable in burns, which is distinct from the ordinary stimulatory effect produced by traumatized, infected, or necrotic tissue. This inhibitory effect is characterized by "degenerative" changes in the white blood cells which can be differentiated from the "regenerative" changes resulting from ordinary stimulation. Whereas the regenerative blood picture is due to inflammatory stimulation, the degenerative blood picture is a result of toxic inhibition. There is, therefore, a true toxemia in burns, distinct from trauma and hemoconcentration, on the one hand, and sepsis, on the other, and due to the absorption of some toxic substance from the burn area.

From the first to at least the third or fourth day following a burn, the white blood-cell picture must be closely watched if the onset of toxemia is to be predicted. In the cases of severest toxemia the degenerative changes come on rapidly and are extreme. By observing the degree of degenerative changes in the white cells, the presence of toxemia can be recognized and its severity estimated. This is more difficult when the picture is a mixed degenerative-regenerative one since inhibition and stimulation are both acting together. If toxemia is not extreme but still severe, the prognosis may depend on whether or not regenerative changes are present. If the changes are mixed regenerative-degenerative and of marked degree, it indicates that some complicating infection has developed, such as bronchitis or pneumonia. In such cases, the prognosis is still poor, but it is probably in just such instances that the best hope lies of further lowering the mortality rate of burns.

The degenerative white blood-cell picture is found in many conditions besides burns — for example, intestinal obstruction — which shows that the inhibiting toxin is not specific.

During the toxic phase of burns the prognosis may depend on the degree of degeneracy of the white blood-cell picture. If the picture is mixed degenerative-regenerative, the prognosis is worse than if a similar degree of degenerative change is present alone.

The giving of large whole-blood transfusions, begun immediately after the period of hemoconcentration and repeated as indicated by the appearance and disappearance of degenerative changes in the white cells, is probably the best general measure available to combat the toxemia of burns. It is suggested that the injection of crude liver extract be combined with the giving of blood transfusions during the toxemic phase because of its known beneficial effect on the degenerative white blood-cell picture. It may be that liver extract acts through its beneficial effect on hepatic function in general and its detoxifying ability in particular. Doses of 10 c.c. given intramuscularly during each twenty-four hours of the toxic phase should be adequate to produce a maximal effect.

JOSEPH K. NARAT, M.D.

Banfi, R. F., Tanturi, C. A., and Bay, R.: Prothrombin in Preserved Blood. *J. Lab. Clin. M.* 1945, 30: 512.

The authors state fresh blood transfusion is an usual procedure in instances in which hemorrhage is due to disturbances of coagulation; in such cases blood transfusion is most important since the blood contains all the necessary factors for normal coagulation. Should preserved blood be administered in cases of hemorrhage due to hypoprothrombinemia, it is advisable to learn beforehand whether the blood to be transfused contains sufficient amounts of prothrombin, so that the patient's blood may be given momentarily its capacity for normal coagulation.

Several investigators have studied the prothrombin stability of preserved blood for transfusions. There is considerable disparity in the medical literature regarding the speed and degree of disappearance of prothrombin in preserved blood. The authors believe that the methods employed to determine the prothrombin concentration are responsible for this disparity.

The blood used in this study was obtained from healthy adults in accordance with directions set by two of the authors; that is, by mixing 9 volumes of blood with 1 volume of 0.1 N sodium oxalate. The blood was divided into two portions; one portion was aseptically stored in 2 c.c. ampoules; the other was centrifuged and the separated plasma was kept in 1 c.c. ampoules. These were kept in the icebox for the entire duration of the experiment. For fibrinogen solution, barium plasma was used which was prepared from the plasma of healthy human beings at the very moment the determinations were carried out. By diluting the plasma under study with fresh barium plasma, changes which could be attributed to the plasma itself were avoided. Cultures which were prepared from the plasma a few days after its separation were invariably negative.

In concluding, the authors note that during the first three days the prothrombin time of preserved plasma and blood undergoes slight variations. From then onward the time gradually and continuously increases until the plasma, in spite of the addition of thromboplastin and calcium, becomes noncoagulable. This final noncoagulability is not due to an absence of prothrombin.

The prothrombin concentration, by the authors' technique, gradually increases and reaches its "maximum" at the end of three days when it doubles its original value; later on it gradually decreases, and by the end of five months it reaches a 30 per cent concentration. A hypothesis is put forward by the authors that this increase in concentration registered in the first few days is due to prothrombin "sensitization." After a certain period, transfusion of preserved blood or plasma will not correct a prothrombin deficiency. HERBERT F. THURSTON. M.D.

Thalhimer, W., and Taylor, E. S.: Low Agglutinin Titer of Pools of Plasma. *J. Am. M. Ass.*, 1945, 128: 277.

The anti-A and anti-B agglutinin titers were determined in 1,354 pools of human plasma. The number of individual plasmas in the pools varied from 6 to 50. The pools of plasma were either random samples or every fifth or tenth as they were processed routinely. Of the 1,354 plasma pools, only 2 had macroscopic titers of 1:40, 1 had a titer of 1:60 and 1 of 1:80.

In 355 small pools made up of plasma from 6 to 10 individuals, the percentage of relatively low titers, from 1:20 to 1:40, was somewhat higher than in pools made up of plasma from a larger number of individuals, but the percentage of titers of 1:40 or higher was not greater than in the larger pools.

Pools of plasma were prepared entirely of type O plasma so as to secure the highest possible agglutinin titers, both anti-A and anti-B. These titers ranged up to 1:256. Seventy-five (500 c.c.) dried units of these plasma pools were reconstituted and administered intravenously to type A or B individuals. No reactions were caused, and there were no signs or symptoms of intravascular agglutination from the relatively high titered plasma.

Pooled plasma, as prepared in small pools at hospital blood banks or in larger pools at processing laboratories, with the blood groups entering each pool by chance and without selection, can be administered with safety to all individuals, regardless of their blood types, and without fear of causing any harm because of isoagglutinin content or of causing any signs or symptoms of intravascular agglutination.

JOHN E. KIRKPATRICK, M.D.

Marcoulides, J.: Luteinizing or Folliculinizing Opotherapeutic and Heterohemotherapeutic Transfusions. Some Remarks on the Endocrine Treatment of Menorrhagia, Oligomenorrhea, Dysmenorrhea and Functional Amenorrhea (Transfusions opothérapiques et hétéro-hémo-thérapies lutéinisantes ou folliculinisantes. Quelques remarques sur le traitement endocrinien des ménorragies ainsi que des oligoménorrhées, dysménorrhées et aménorrhées fonctionnelles). *J. R. Egyptian M. Ass.*, 1943, 26: 256.

Eleven cases are described in which transfusions or intramuscular injections of blood were used in the treatment of menorrhagia, oligomenorrhea, dysmenorrhea, and functional amenorrhea with remarkably good results that persisted for from four to forty-five months.

These results were more satisfactory than those obtained with any method of hormone therapy. At first small transfusions of 50 c.c. of blood were used, but later it was found that as good results were obtained by the intramuscular injection of 20 c.c. of blood into the gluteal region. If a luteinizing action is desired the blood is taken from the donor from one to three days before menstruation; if a folliculinizing action is desired the blood is taken from a week to ten days after menstruation.

The authors believe that a careful diagnosis must be made to determine that the gynecological disturbance is due to endocrine causes and so far as possible it should be determined whether the trouble is caused by an excess or deficiency of folliculin or lutein.

Apparently in these cases the results were not obtained from the use of hormone alone, for the amount of hormone given was very small. The blood evidently contains some unknown substance which brings about the most complete action of the hormone either by its mere presence as a catalyzer or by some other as yet unknown action, or the blood may contain other hormones, particularly hypophyseal or gonadotropic. Further research is necessary in order to settle these questions.

AUDREY G. MORGAN, M.D.

SURGICAL TECHNIQUE

WAR SURGERY

Power, R. W.: Gas Gangrene and Vascularization of Muscles. *Brit. M. J.*, 1945, 1: 656.

Three factors are essential for the establishment of gas gangrene—the presence of pathogenic clostridia, an adequate mass of ischemic or necrotic muscle, and delayed or faulty surgery. The first two are unavoidable, and can be effectively countered by early adequate surgery. Apart from cases in which there is gross destruction of a limb, gas gangrene is most lethal in the thigh and buttocks, and all cases of shell wounds in these areas should be given operative priority.

Muscles are supplied by one or more arteries. If one of these is injured, that part of the muscle supplied by the injured vessel becomes ischemic. Re-establishment of the collateral circulation within such a muscle appears to be extremely slow, and in open wounds, necrosis invariably results. If clostridia are present, gas gangrene occurs. Muscle deprived of its blood supply for six or eight hours dies. If operation has not been undertaken during this period, all bloodless muscle must be excised. If one group of muscles is avascular, it should be removed. If two groups are involved, the limb should be amputated.

If the radial and ulnar arteries are severed below the recurrent branches, the forearm is cut off from all blood supply, and early amputation should be performed. Ligature of the brachial artery, however, does not necessarily endanger the life of the limb. When a main artery has been ligatured in the leg, the patient should be watched hourly, and amputation performed at the first sign of clostridial infection. Particularly dangerous is the case in which the femoral artery has been ligatured, and there is an additional wound in the lower leg; in such cases, primary amputation should be done. Severance of the anterior tibial artery is more prone to cause gas gangrene than severance of the posterior tibial artery, for the peroneal artery can carry on the circulation in the calf. If the anterior tibial artery requires ligature, its muscles below this point are ischemic and should be removed.

Since many war wounds are contaminated with clostridia, gas gangrene will ensue if ample necrotic muscle is present. The elimination of the gas gangrene can come only from early and efficient surgery, which can be greatly aided by a thorough knowledge of the blood supply of the muscles.

SAMUEL KAHN, M.D.

Capper, W. M.: Treatment of Battle Wounds; Two-Stage Operation. *Lancet*, Lond., 1945, 248: 587.

At a forward base hospital in Italy during the six months ending September, 1944, 2,024 battle casualties were received and 1,202 operations performed for delayed primary suture. Most of the patients had multiple wounds; so one operation might involve the suture of two, three, or more wounds—in 1 case there were thirteen.

For success two factors are essential: (1) early adequate planned decompression of the wound at the initial operation forward, and (2) facilities for early transportation of the wounded man to a center where definitive surgery is possible and where he can be retained for ten days or more.

It has been the policy to examine all wounds in the theater on the day after arrival. The reparative operation seems to have its best chance when done as soon as possible after the third day from the initial surgery. The benefit of early operation outweighs the advantage of any preparation beyond twenty-four hours of painless rest and adequate fluid intake.

Attention should be paid at this stage to the condition of the blood. Of 183 consecutive patients with serious wounds examined between the third and eighth day after wounding, 76 (41 per cent) had a hematocrit below 35 per cent, although the majority had been given 1 or more pints of blood at the time of the initial surgery. The packed-cell volume should be maintained above 35 per cent in all cases by the transfusion of fresh blood till the epithelial barrier prevents further protein loss.

According to the type of wound encountered, it was treated with a powder or with penicillin solution. The powder was either 1 per cent proflavine in sulfathiazole or calcium penicillin; both types appeared to be of equal value. Sodium-penicillin solution (250 units per cubic centimeter) was used when it was impossible to obtain adequate débridement in a long tracking wound through muscle groups or near vital structures, or when it was impossible to avoid dead space; it was introduced through fine rubber tubes. Adequate drainage is important to get rid of the gram-negative pus that collects in these spaces, and this is best removed by aspiration of the tubes twice a day before the introduction of the fresh solution.

A course of sulfathiazole by mouth after operation seems to be of definite value. Penicillin was used parenterally in comparatively few cases of this series, but this type of administration is certainly of great benefit when suture of multiple wounds is attempted.

Accuracy of suture and skin approximation is amply repaid. Fine sutures of silkworm gut closely placed give the best results, and when the skin edges cannot be straightened, vertical mattress sutures or a pulley stitch are of special value. Deep tension sutures over buttons may be used with advantage, especially in buttock wounds, in which the maintenance of apposition of the deep tissues is difficult. A certain amount of tension may be allowed according to the area being sutured, for instance, in the arm and thigh where the underlying edema will soon respond to elevation. On the other hand, over the scapula,

great trochanter, and the subcutaneous tibial surface tension will certainly result in wound breakdown. Buried sutures are for the most part unnecessary, and it is better to avoid them.

Dead space is unavoidable in many of the wounds. If it is deeply situated, the best course is to introduce a penicillin tube with dependent drainage. By the seventh day, when the tube is removed, most of the space will have been obliterated by the fast-growing hemorrhagic granulation tissue that forms in the presence of penicillin. The hole for the drainage tube can then be sutured if necessary. Superficial dead space is a more difficult problem. Tentage of the space with an epithelial bridge is almost certain to fail. It is best either to rotate a skin flap to fall into the underlying hollow, or to suture the skin edges to the shelving walls of the gap and cover the intervening space with a split-skin graft. It is important to pay close attention to general principles with regard to viability when a flap is used for this purpose. Union of the original or marginal skin of a wound is the best possible cover, but when this is not feasible it has been the aim to apply a skin graft to the denuded area at this stage when the fresh muscle surface gives a greater likelihood of take.

The importance of a firm pressure bandage, of absolute fixation of the part in the plaster, and of elevation cannot be exaggerated. Plaster back-slabs, with additional side-slabs as found necessary, fixed with wet open-woven bandages, have proved more satisfactory than circular plaster, if (as is usual) the wound was to be inspected five days later.

Contraindications to suture are surprisingly few. The most common are established infection, incomplete wound excision, and involvement of a blood vessel or joints.

Over 85 per cent of the wounds have epithelial cover on the fourteenth day after suture. The scars are healed, firm, and dry. While resolution of the lesion in the deeper tissues may take weeks or months, loss of tissue fluid and infection are prevented, and the improved condition of the patient is manifest.

All wounds are worth suturing, however trivial; indeed small wounds are the most important from the point of view of economy of man power.

The scars following suture are more supple and less adherent than those that follow granulation. A comparison of 58 thigh wounds selected at random from convalescent-depot records shows that the average time away from duty was one hundred and four days for unsutured wounds, and eighty-eight days for sutured ones. This is too small a figure to be convincing, but it is noteworthy that 90 per cent of the men with sutured wounds returned to duty in category A-1, compared with 54 per cent of those whose wounds were not sutured.

On an average, superficial flesh wounds are fit for the convalescent depot at the end of the third week, and the more extensive wounds, with deep muscle laceration and tracks, at the fourth to sixth week, according to the degree of skin loss.

CHARLES BARON, M.D.

Hendry, R. W., Gledhill, W. C., and Price, B. H.: Treatment of Battle Casualties; Two-Stage Operation. *Lancet*, Lond., 1945, 248: 618.

Turner, A. C., Murray, A. A., and Fowler, G. A. Treatment of Battle Casualties; Two-Stage Operation. *Lancet*, Lond., 1945, 248: 621.

Atkins, J. B., and Holden, B.: Treatment of Battle Casualties; Second Stage in Two-Stage Operation. *Lancet*, Lond., 1945, 248: 622.

McEwen, R. J. B., Bickerton, J. H., and Pilcher, M. F.: Compound Fracture of the Femur; Two-Stage Operation. *Lancet*, Lond., 1945, 248: 623.

Bhatia, D.: Delayed and Secondary Suture of War Wounds. *Lancet*, Lond., 1945, 248: 623.

These five communications are all based upon casualties streaming back from the Gothic Line in Italy during the later summer and early fall of 1944. By this time the methods of treating battle wounds in Italy had become fairly well standardized, consisting roughly of immediate, first-stage operative treatment, in which the wound was 'trimmed,' dead tissues and foreign matter were removed (metalic bodies not considered dangerously nocuous unless retained between the ends of fractured bones), and a dressing of sulfathiazole-penicillin powder or powdered sulfanilamide alone, or other available sulfapreparation, and, finally dry, or paraffin gauze was placed over the open wound. Almost all of the patients had received antitetanic serum and a short oral course of sulfanilamide; many had been given gas-gangrene serum, transfusions of blood, or plasma. In some fractures of the femur a Thomas splint was applied, in others some retentive dressing, and the patient was sent back by means of air or ship evacuation to the base hospital. In these evacuations the superiority of air evacuation is granted, but Hendry *et al.* point out that the slower means get just about as good results; their figures show that penicillin can overcome any slight delay in evacuation. Later, these same authors conclude that wounds in which penicillin-sulfathiazole powder has been used at the primary operation at the front lines differ but little as regards results from those in which sulfonamide powder alone has been used. This finding has an important bearing on surgery in tropical countries where penicillin could not be stored in the forward area at the correct temperature.

Six days, more or less, after the wounding an attempt is made to suture the wound, this being designated by some of these authors as the second stage of the operative treatment, and by others as the delayed primary suture of war wounds. The only contraindications to this suture are (1) insufficient skin, and (2) interstitial cellulitis, or gas gangrene. Even multiple wounds and deep open wounds in communication with fractures are sutured completely, if possible, or at least partially, perhaps with undermining of the subcutaneous tissues. At this operation the wound is again revised and excised if it seems necessary (bacterial findings are of no great importance, clinical judgment will suffice), but in open fractures no attempt is made to clean out the

hematoma at the fracture site, with its comminuted bone fragments and no considerable effort is made to locate metal fragments. Instead, in addition to the standard procedures for the shallow, soft-tissue wounds, in these fracture cases a stab wound is made down to the fracture and a small rubber tube, or tubes, according to the size and seriousness of the wound, is led down to the fracture area, and a solution of sodium penicillin solution (3 c.c. of a solution containing 500 Oxford units per cubic centimeter) is injected twice daily into the tube or tubes for five days. Each patient also received 300,000 units of sodium penicillin by intramuscular injections, the course commencing on the day of operation. In the work of Atkins *et al.* it is recorded that a few patients, especially those with grave, multiple wounds receive, in addition, a short course (about 300,000 units) of sodium penicillin, a procedure which they now, however, consider to be unnecessary in the majority of ases.

The standardized treatment at the second stage, or suturing of the wound, is more or less as follows:

In the operating room, under 'pentothal' anesthesia the retentive dressing (splint, plaster cast) and the wound dressings are removed, a wound swab is made for bacteriological examination (this has little influence on treatment), the wound area is prepared surgically, and the wound is revised; this revision includes gentle insertion of the finger into the wound to determine the extent of the injury and to ensure that no loculations of exudate are present, and then suture is carried out if necessary. After the suture no further dressing is attempted, except for the sodium-penicillin instillations in the case of deep wounds as described, until the fourteenth day, at which time the wound is reinspected in the operating room and the stitches are removed. When only partial suture has been accomplished at the previous operation, it is sometimes possible at this dressing period to either complete the suture or perform a skin graft. A fresh plaster is now applied in fracture cases and the position of the fragments is checked by roentgenography. After this no further inspection of the wound takes place until the sixth week, when final assessment and disposal of the patient is made.

With apparently unimportant individual variations of the method for treating the battle wounded, which has been roughly outlined, the authors of this series of articles treated a total of 2,463 war wounds, with results which at best are astounding, and at worst compare favorably with any comparable series.

In the 465 flesh wounds reported by Hendry *et al.* the estimated average percentage of complete healing in ten days was 83. Ninety per cent of the patients who were treated with penicillin at the forward stations and 89 per cent of those who were treated with sulfonamide were healed in ten days. In a control series under the same conditions, except that no local chemotherapy was used, the percentage of healing was only 63. In the series of 128 cases of open fractures treated by these same authors, 96 (75 per cent) were closed by the sixth week, that is, 82 (64 per cent) were completely closed with sound skin healing, and 14 presented healthy granulating wounds. Thirty-two (25 per cent) were still open fractures, if a small sinus leading to the fracture site is considered an open wound. When the cases which could be completely closed at the time of the first operation are analyzed separately, it is found that of these 86 wounds, 75 (87 per cent) were closed in six weeks; the only open lesions in this group were found on the clavicle, tibia, and the region of the ankle, where there is inadequate tissue buffer between the bone and the skin. In 5 patients in the whole material there was great tissue loss and severe infection; nevertheless 3 of these wounds had closed by the eighth week. Clostridial myositis was present in 4 of the wounded, and in these the condition was controlled by excision and after-care, amputation being necessary in only 1 instance. No deaths are mentioned.

Turner *et al.* reports two series of battle wounded; in the first there were 380 primary wound excisions, while their team was still a forward area unit. Among these cases were 7 with gas gangrene; 3 amputations were done. No deaths occurred in these 7 cases. After this team had been left behind and began acting as a base hospital they then received for treatment 175 cases in which primary excision had already been performed. In this material, upon institution of the secondary operation, that is, suture or an attempt at suture, from the third to the fifth day after the primary wound excision had been done, these authors were able to get what they designate as a successful result—a healed wound at the tenth day in 99 (63.4 per cent) of the cases; a partially successful result—a healed wound at the twentieth day in 42 (26.9 per cent); and an incomplete result, or failure (an incompletely healed wound after twenty days) in 15 (9.6 per cent). Thus, 141 patients (90.4 per cent) were fit for discharge to the unit or the convalescent depot between the twenty-first and twenty-eighth days. Among these there were also 7 instances of gas gangrene. Of the latter cases, 4 were sutured, with healing in 2 by the tenth day (of course, much of this success must probably be ascribed to efficient excision of the contaminated wound tissues at the time of the excision, at the front-line dressing stations). One wound was healed by the twentieth day and 1 case was classed as a failure. The remaining 3 patients had to undergo amputation. Here again no deaths are mentioned.

The cases reported by Atkins *et al.* consist of 847 wounds, of which 665 were flesh wounds. These were treated by delayed suture (on the third to fifth day), and of these, 512 presented successful results (complete healing by the tenth day); 127 presented partially successful results (complete healing of more than half of the wound at the 10th day); and 26 presented unsuccessful results (less than half-healed wounds after ten days). In addition, there were 85 open fractures treated in the manner already described, with success in 82 instances, and failure in

10. Thus, in this entire material there were 658 successful results, 143 partially successful results, and 46 failures. There was only 1 death, and this occurred several weeks after the wound had healed, and was unrelated to it.

The material of McEwen *et al.* consists, as indicated in the caption, exclusively of open fractures of the femur. At the orthopedic center in Italy where these surgeons worked, the treatment methods were much the same as those described in the other articles, and the results were regarded as successful if the wound was converted from an open to a closed one within a reasonable length of time. Assessment of the reasonable length of time, however, depended rather upon the size and site of the original wounds and the possibility of closing them by suture. For instance, 1 patient had a clean linear wound, 8 inches in length, at the midthigh, which was sutured without difficulty: it healed in eighteen days. Another, on the other hand, had two clinically dirty wounds, one of which measured 9 by 4 inches; there was very extensive destruction of the buttock muscles and comminution of the great trochanter and the femoral neck. It was not possible to close the large wound completely and the case was regarded as eminently successful when the skin was healed completely in ninety-one days without any antecedent sepsis. Judged by these standards, therefore, success was attained in 47 (80 per cent) of the 59 cases in which delayed primary (second to eighth day), or secondary (after the tenth day) suture was performed, the average time of healing being thirty-four days. The 12 cases here classified as failures (not sutured within ten days of receiving the wound), nevertheless never gave any cause for anxiety; no chronic septic state ever developed; and no amputation or death was recorded. The remaining 5 patients with open femoral fracture could not be sutured because of the size of the wound or the presence of gross infection, and 2 of these, nevertheless, are regarded as successes and 3 as failures. Here once more, no deaths are mentioned.

Bhatia's material consisted of 404 wounds with 177 delayed primary sutures (within ten days of primary excision), with complete healing (100 per cent) in 166 (96.6 per cent); in 5 patients the healing was between 90 and 99 per cent; in another 5 it was between 50 and 89 per cent, and in only 1 patient was there less than 50 per cent healing at the end of the period (not specified) of observation. In the remaining 227 wounds the suturing was secondary (after ten days) with complete healing (100 per cent) in 185 (85.9 per cent); in 10 the healing was between 90 and 99 per cent; in 24 it was between 50 and 89 per cent; and in 8 it was below 50 per cent. In this series of cases the results of suture were as satisfactory in the wounds associated with compound fractures as in the cases of simple flesh wounds.

In the entire series of articles here reviewed, practically no attention was allotted to the ultimate results, aside from a brief mention of residual palsies, and a few figures attempting to show that treatment with penicillin had no adverse effect on the formation of callus in the patients with fractures.

JOHN W. BRENNAN, M.D.

Stammers, F. A. R.: The Policy of Delayed Suture; Role of the Forward Surgeon. *Lancet*, Lond., 1945, 248: 586.

Delayed suture was practiced during the latter half of the last war. It has come into use again during the past eighteen months, and in Italy conditions have been favorable to its employment on a large scale. Results are extremely gratifying, for with the advent of penicillin a much higher proportion of successes is obtained than in 1917.

The conditions necessary for a general policy of delayed suture to be successful are:

1. Adequate forward surgery appropriate to the terrain.
2. Short lines of evacuation with base hospitals within a few hours' distance of the advanced surgical centers. (Cases must reach the hospital at which the suture is to be performed not later than the third or fourth day after the primary operation.)
3. A group of surgeons at the base fully alive to the possibilities of delayed suture and organized accordingly.

The following rules are now followed by all forward surgeons in Italy.

First shave a wide margin of skin around the wound and wash it with soap and water. Then apply some such antiseptic as flavine in spirit, or iodine. Remove only the pulped or frayed edge of the skin; the skin wound must be extended by incisions long enough to allow retractors to be inserted to the full depth of the wound so that it can be fully inspected. Excise any dirty fat or fascia and cut off any tags of fascia. Remove all muscles that do not bleed or do not contract when cut (imperfect removal of devitalized muscle carries the risk of gas gangrene, and in any case leads to sepsis and hence to a wound unfit for early suture). Remove any pieces of bone that have no periosteal attachment. Remove any indriven clothing, equipment, or dirt, and any fragment of metal that is readily accessible. Lay open all nooks and crannies in which pockets of pus may collect. Make generous incisions into the deep fascia, transversely as well as longitudinally, as a prophylactic decompressive measure. At the end of the operation a good frosting of penicillin-sulfonamide powder is applied, and during operation many surgeons pour into the wound 1/1000 acriflavine or proflavine—an antiseptic in which many gained justifiable faith in peacetime traumatic surgery. A dressing of sulfanilamide-paraffin gauze is applied, but no packing and no stitches are permitted. One need not be afraid of making a long incision: it can be closed at the base, and indeed it is easier to suture than a circular hole. Adequate incision is particularly important when there is a deep and extensive muscle wound lying beneath a small wound of entry. When a through-and-through wound is superficial it

is best to join the two together, but when it transfixes deeply—as through the quadriceps or deep to a vascular bundle—each wound should be treated separately as described. For major muscle wounds, of the buttock, thigh, calf, axillary folds, a three-day course of penicillin is given, either intramuscularly or by glucose-saline drip. The dose is 15,000 units every three hours.

There is no doubt that penicillin has contributed to the reduction of the mortality from gas gangrene, although efficient forward surgery will always be the first line of defense. An essential part of treatment is adequate splinting. Quite apart from fractures, every wound involving muscle should be splinted, the best form being a plaster back-slab or a light cast; it should include the joint below, for otherwise the patient travels in pain and the wound is pulled on by the irregular movements of the ambulance. Experience shows that Cramer wire is too springy to give comfort during travel over rough roads. Finally, after operation the wounds should not be inspected until the patient has reached the theater of the hospital at which suture is to be performed. In the absence of pain and toxemia any exposure of the wound at staging posts is meddlesome and will certainly lead to superimposed infection.

This technique is applicable to all wounds, whether of the limbs (with or without fracture), the chest wall, the back, or the axilla. The flaps of amputation stumps are left open; even two guiding stitches are likely to result in the accumulation of clot which in turn is a source of sepsis.

If there be any who would criticize the general management of wounds in forward areas it must be remembered that the traumatizing effect of the subsequent ambulance journey over rough roads dominates the activities of an advanced surgical center and to a large extent dictates what forward surgeons may or may not do. A fundamental fact in the policy of delayed suture is that the suture must be performed not later than from the third to the fifth day. The responsibility of getting patients back to the base hospitals rests with the forward units, and it means that patients should arrive not later than from the second to the fourth day. Here difficulties arise, for in this moving warfare lines of evacuation are stretched and uncertain, and it is not always possible to deliver patients to the base in less than a week. Forward hospitals dare not undertake their own delayed sutures, unless they can hold the cases for at least ten days, which may be impossible in times of stress; and stitches and ambulance journeys are incompatible. CHARLES BARON, M.D.

Lawrie, R.: Primary Closure of Battle Wounds of the Face. *Lancet*, Lond., 1945, 248: 625.

In wounds about the face a major closure is defined as one involving a compound fracture of antral or buccopharyngeal cavities, but other closures, however large or extensive, are classed as minor. "Complicated" implies a complication which inevitably makes the case a long-term one which must be evacuated to base. Primary closure indicates complete closure, without drainage, of the facial wound, if possible within forty-eight hours. This is the upper limit of safety, in which primary healing in three days may be consistently achieved.

Under local anesthesia, a wound toilet is done; the skin edges are excised and undermined, and hemostasis is secured by hot flavine packs. A subcutaneous tissue layer is then fashioned and closed with catgut, the skin is accurately sutured, and a pressure bandage applied. Even in antral closures, antral hemostasis is secured with very hot flavine packs, all fragmented bone and lacerated soft tissue that has no functional importance or chance of survival is removed, marginal skin is excised and undermined, and about 1.5 gm. of penicillin-sulfathiazole powder is applied. The wound is accurately closed (there is usually an adequately draining traumatic nasal antrostomy), the deeper soft-tissue layer with 6/0 catgut and the skin with fine silk. A paraffin-gauze-flavine pressure dressing is applied and the sutures are removed on the second, third, or fourth day, after which dressings are usually omitted. All antral cases have a routine course of oral sulfathiazole, 1.0 gm. every four hours for four days. In cases of mandibular comminution involving the tooth sockets, bone suppuration is common, and it is often wise to drain the wound. Most of the cases here reported were operated on in a tented theater, without the use of gowns or gloves.

With the method here described, 270 operations were done on 379 face wounds, and 134 of these patients were returned to duty without evacuation to the base. Of the 379 patients, 140 had primary wound closures; 21 of these presented major uncomplicated cases, of which 11 returned to duty after an average of six days, and 2, with infection, after twelve days; 8 were evacuated. Of the 41 presenting complicated cases, (20 involving the jaws), all were evacuated and 1 died. Of the 59 presenting uncomplicated minor wounds, 53 returned to duty after an average of four and three-tenths days, and 3 were evacuated. One patient of the group of 19 with complicated minor injuries died.

Advantages of the method are: (1) quicker recovery, (2) reduction of work for the dressers, and (3) fewer complications. Even skin loss (contusion) is no contraindication, as partial closures usually hold and split-skin grafts can be used to close the residual skin defect. JOSEPH W. BRENNAN, M.D.

Ogilvie, W. H.: Surgical Lessons of War Applied to Civil Practice. *Brit. M. J.*, 1945, 1: 619.

With regard to possibilities of applying the lessons acquired in the war to the problems of civil practice, the progress gained in this war is outlined briefly as consisting of three phases:

In the first, treatment by the closed plaster method was the rule. In addition to the immobilization without constriction provided by this method, free drainage and chemotherapy were used, with skin cover at a later date. The closed plaster method is

safe and gives excellent results under desperate conditions, and when the wounded arrive in numbers too great to allow frequent supervision after operation.

In the second phase, wounds were excised and drained, the limb was immobilized in a padded plaster cast or some form of plaster box splint, and suture or skin grafting was attempted about the third week, or as soon as the surface was covered with healthy granulations. This seemed the best that could be done in the period of long communications and poor supplies.

The third or present phase is that in which the wounds are excised by the forward groups and closed by delayed primary suture at the base between the fourth and sixth day. At the primary operation, or so-called excision, foreign bodies and dirt are removed and all damaged tissues are cut away; the skin is freely incised to allow access to every pocket, but only the barest edges of this covering layer are trimmed off. A simple dressing, usually vaselined gauze, is applied to the surfaces of the open wound, and the limb is immobilized in plaster. As soon as the patient reaches the base hospital the possibilities of suture are assessed by the study of his general condition and of the notes of the first operation, the wound itself not being inspected or disturbed as yet. The patient is rested for one day, during which any deficiency in his blood count is made up by transfusion, and then, usually on the fourth to sixth day, in the operating theater under full aseptic ritual, the dressing is removed, the wound surfaces being disturbed as little as possible, although some tags or pieces of exposed tendon left at the primary excision may be trimmed away—and if the wound appears to be clinically healthy at this stage (even though it may prove on culture to harbor pathogenic bacteria) it can be sutured at this time. The skin is brought into apposition by interrupted sutures of some unabsorbable material, which may also take up deeper layers, but no buried sutures are used. The limb is finally immobilized a second time in a plaster cast, and the stitches are removed between the tenth and twelfth days.

In general, the method described for the third phase of development is the one which England's surgeon general recommends for adaptation to civilian practice. It should always be remembered, of course, that wounds in civil practice tend to differ somewhat from those caused by modern weapons in that they never show extreme devitalization, nor are they often contaminated to the same extent. For these reasons a too rigid comparison cannot be made, but nevertheless the wisdom of unrestricted drainage, and the value of closure by suture or skin grafting before the changes of deformity, pain, scar tissue, and limited movement occur, cannot well be ignored.

Of course, the military surgeon has gained experience in many matters pertaining to other than purely operative surgery and perhaps his most important advances in knowledge have had to do with hemorrhage and shock. Plasma loss is the chief feature of the shock from burns, and blood loss is the chief feature of the shock accompanying wounds. Plasma may be sufficient after burns, but in wound shock the lost blood must be replaced by blood early before irreparable damage is done. It must be replaced rapidly, i.e., at the rate of a pint in from ten to fifteen minutes, till the systolic blood pressure has reached 100 mm. It must also be replaced adequately, i.e., till the restoration is within 90 per cent of normal. If the patient is anemic on admission to the hospital the blood deficiency should be fully made up before the operation is started. Clinical observations show that men with a hemoglobin of less than 70 per cent show little evidence of repair in their wounds, but start to do so after a transfusion of 2 pints; and that men whose blood loss has been fully restored within a few hours of wounding seldom get gas gangrene. If during the operation, however, the patient loses more than the usual amount of blood, replacement should, in most cases, be deferred till reaction to the anesthetic and operative handling is over and his circulatory requirements can be assessed calmly and accurately in the ward. A blood drip should not be set going at the beginning of the operation unless a blood loss of at least 2 pints is anticipated.

As regards the loss of proteins in burn patients and in cases in which the intake is low, as in starvation or even following the average invalid diet, the protein content of the plasma sinks from its normal 6.7 per cent often to not more than half of that amount, and replacement may be made dietetically with eggs, cheese, and other easily absorbed proteins. In the ill, it may be made by transfusions of plasma, or, perhaps, when the need is extreme, by the intravenous administration of amino acids. More recently the value of intravenous administration of amino acids in combating liver damage has been shown.

In the field of chemotherapy it is believed that as soon as penicillin can be produced cheaply and in a stable form that can be given by mouth, the use of sulfonamides will almost disappear, unless fresh compounds are found which will cover blind spots in the penicillin range. This prediction is made in spite of the fact that at present the sulfonamides are preferred for infections by the bacillus-coli group, which are sulfonamide-sensitive but penicillin-resistant.

In concluding the author advocates the "pyramid of responsibility" principle in the interrelationships between the individual physicians in civil practice, which he intimates has been attained in military practice. This should take the place of the free lance methods so often in vogue with neglect of special training and experience in surgery. In this connection he also advocates the teaching (with perhaps the exception of surgery of the hand) of very much less operative surgery to undergraduates, and recommends the ritual of the operating theater and the gradual undertaking of operations of increasing difficulty for the postgraduate student who intends to pass to higher qualifications and adopt surgery as a career.

JOHN W. BRENNAN, M.D.

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Ransohoff, J. L.: The Surgical Treatment of Lymphedema. *Arch. Surg.*, 1945, 50: 269.

The treatment of elephantiasis has been a puzzling one, and is not influenced by etiological factors which the author classifies as follows: (1) filariasis, (2) obstruction of the normal lymph channels by inflammatory or scar tissue, and (3) obstruction of the lymph channels by some obscure lesion, i.e., idiopathic obstruction.

The author believes the operation suggested by Handley in 1908 should be given further trial, since the Kondoleon operation is extensive and has given indifferent results. The principle of the Handley operation is to bury long silk sutures in the edematous area to serve as permanent lymph channels and to conduct the lymph away from the infected area to normal lymph channels.

Two cases are presented in which a modified Handley operation was performed. Double strands of No. 1 nylon were used in place of silk, as it was thought they would be less irritating and remain in the tissues indefinitely. These strands were threaded under the superficial fascia through multiple small incisions along the involved extremity with an especially constructed probe. Almost immediate improvement was noted with subsidence of the swelling. There was no secretion from the wounds and the results were gratifying. DOUGLAS R. MORTON, M.D.

Brown, J. B., and Cannon, B.: Full-Thickness Skin Grafts from the Neck for Function and Color in Eyelid and Face Repairs. *Ann. Surg.*, 1945, 121: 639.

Full-thickness skin grafts from the neck and clavicular region are recommended for use in eyelid and face repairs because of their superior qualities for color matching and function. There is a natural redness in these grafts not found in other skin and their thickness and softness allows for the best kinesis or function of the underlying muscles. Late function is excellent since there is minimal contracture of the graft bed when these grafts are used.

The scarred or deformed area is dissected free and a pattern of the resulting defect prepared with pliofilm or celluloid. The pattern is marked out usually just above the inner third of the clavicle and the graft removed in the usual manner. The donor site may be closed, partially closed and partially left open, or covered with a split graft.

The grafts are set in place accurately with interrupted sutures of light silk, and the ends of the sutures are left 3 or 4 inches long for subsequent fixation over a waste form. No holes are cut in the graft, which is covered with fine-mesh greased gauze, and a wad or form of white cotton or mechanics waste is packed carefully over this. Appropriate opposite pairs of sutures are then tied firmly over the waste as the assistant compresses the form with his fingers or instruments.

Dressings are applied on the third to sixth day and subsequent ones repeated as necessary; they are usually left off about the tenth day. In a wide experience with this technique, the authors report no full-thickness losses. JOSEPH J. MCDONALD, M.D.

Ansbro, F. P.: Positive-Pressure Respiration in the Treatment of Acute Pulmonary Edema. *Am. J. Surg.*, 1945, 68: 185.

Two cases of acute pulmonary edema are reported, in which positive-pressure respiration with oxygen was followed by a prompt clearing of the condition with recovery.

The first patient was a physician, who took an overdose of sedative medication the night and morning before operation. Respiratory depression following the operative procedure was considered the initial cause of the widespread pulmonary edema that ensued. Inhalation of oxygen by catheter, mask, and tent failed to relieve either the cyanosis or the edema. The application of positive pressure with the anesthesia mask resulted in a swift clearing of both. This therapeutic procedure appeared to be the specific remedial agent, since the signs of edema recurred when the pressure was withdrawn, and again disappeared when the pressure was reapplied.

The pulmonary edema in the second patient probably resulted, in the main, from the primary tracheal obstruction, which necessitated tracheotomy, and was aggravated by the ball-valve action of the wet gauze at the tube opening, which resulted in an increased negative intrapulmonary pressure. The removal of this ball valve produced some improvement in the patient's condition, but she was literally drowning in her own secretions until positive-pressure respiration dammed back the fluid. A simple apparatus was constructed, which effected this promptly and efficiently.

Since the recovery of these patients could be attributed directly to positive-pressure respiration, it is recommended that a more widespread use of this therapeutic procedure be adopted in combating what is so frequently regarded as a terminal clinical event. Although all cases may not react so favorably, the prevention of an asphyxial form of death may make possible opportunities for recovery that would otherwise not be present.

SAMUEL KAHN, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Burns, B. H., Young, R. H., and Muller, G. M.: Wounds of the Knee Joint. *Lancet*, Lond., 1945, 248: 551.

The treatment, prognosis, and results of gunshot wounds of the knee joint sustained in the North African campaign are discussed. Patients were admitted to the hospital with a Tobruk cast from two to eight days after having been wounded. Prior to admission all of them had had primary treatment which consisted of:

a. Excision of the wound within the first twenty-four hours
b. Suturing of the synovial membrane whenever possible
c. Loose packing with sulfanilamide and soft paraffin gauze
d. Administration of penicillin intra-articularly and/or intramuscularly

Within from twelve to twenty-four hours after admission the cast was removed and the wound inspected. Only in 8 cases was there frank pus in the joint cavity. There was a remarkable absence of streptococcal and staphylococcal infection. Many wounds contained coliform bacilli, proteus bacilli, and diphtheroid bacilli, and some contained anaerobic bacteria.

An attempt was made to close every wound in layers. When closure of the synovia was impossible an effort was made to close the capsule and skin completely. It was considered more important to keep gram-positive bacteria out of the joint than to allow drainage for gram-negative pus which usually could be overcome by natural resistance. Most of the patients were given 20,000 units of penicillin three hourly for five days.

Of the 76 completely sutured up wounds, 61 healed by first intention. Four joints contained bacillus coli pus at the time of suture. These joints were aspirated several times but all developed a sinus. In 5 cases the wound could not be closed completely, and a sinus developed in all of these cases. All told, 16 sinuses were observed, 5 of which were still open after six months.

All foreign bodies, if accessible, had been removed at the primary operation. Foreign bodies retained in some wounds were removed two or three weeks after admission. A marble-sized foreign body was left in situ in 4 cases. In all 4 cases it became the cause of infection or irritation and had to be removed at a later date. In many instances a piece of clothing or grass was found in addition to the shell fragment. This also had to be removed because very often it has been found to be a cause for the formation of a sinus.

After the operation a plaster cast was applied to the extremity, a large window being left over the knee joint. The cast was usually removed after ten days. Very often the knee joint remained swollen for about eight weeks. As long as the joint remained painless, movements were encouraged. In cases in which swelling of the joint was associated with heat, tenderness, and pain, the extremity required rest. Five joints that showed bacillus-coli infection developed a definite arthritis with destruction of the articulating cartilage.

Intra-articular adhesions were treated with passive stretching, manipulation under anesthesia, and in a very few cases by arthrotomy and resection of the fibrous bands. Flexion contractures were overcome by traction. In 1 case traction had to be exerted by means of a Steinman pin through the tibial tubercle.

Of 101 patients thus treated 75 had normal knees, 15 had useful knees with a range of motion between 180 and 135 degrees, and 11 had stiff knees.

GEORGE I. REISS, M.D.

Smith, R. O., and Harford, C. G.: The Administration of Penicillin by Continuous Intramuscular Drip. *J. Lab. Clin. M.*, 1945, 30: 502.

The purpose of this study was to determine quantitatively the blood levels obtained by various dosages of penicillin administered by continuous intramuscular drip, and to evaluate the practicality of the method in the treatment of human infections.

The authors find that the continuous intramuscular administration of penicillin affords a practical method of maintaining relatively high concentrations of penicillin in the blood, but that with the penicillin preparations now available, the incidence of local reactions at the site of injection is too great to warrant routine use of the method at the present time. The blood levels attained by the continuous intramuscular drip are approximately the same as those reported with the continuous intravenous method. This fact would seem to indicate that no significant amount of penicillin is destroyed at the intramuscular site of injection. It is of interest that the same linear relationship between dosage and blood level apparently obtains with both the intravenous and intramuscular routes. Blood levels as high as 2 or 3 units per cubic centimeter may be continuously maintained by the intramuscular method. It is suggested, therefore, that the method may be employed advantageously in the treatment of infections caused by relatively resistant bacteria.

More than one-half of the patients treated in the present study developed local reactions at the site of the continuous intramuscular injections. Such local reactions have been described by previous observers. It should be pointed out that relatively crude preparations of penicillin were used in the present study and in those previously reported. There is already suggestive evidence that the incidence of local reactions following intramuscular injections is inversely proportional to the purity of the penicillin employed. It is conceivable that in the near future a crystalline form of penicillin will be available for therapeutic use. If more highly purified preparations of penicillin fail to cause local reactions at the site of injection, the continuous intramuscular method may be retained justifiably as a means of administering intensive penicillin therapy.

BENJAMIN GOLDMAN, M.D

Mutch, N., and Rewell, R. E.: Penicillin by Inhalation. *Lancet*, Lond., 1945, 248: 650.

Calcium-penicillin mist produced by a nebulizer under oxygen pressure and administered to 5 healthy young men was very rapidly absorbed through the mucous membrane. It was computed that half an hour's inhalation of the mist from a nebulizing vial passing from 8 to 10 liters of oxygen per minute and containing a neutral aqueous solution of penicillin of

80,000 units per cubic centimeter would insure an absorption of at least 40,000 units of the drug.

Penicillin mist of this density is respirable without causing any distress provided that the purer forms of penicillin powder are selected. High bacteriostatic titers were established in the blood. The blood values were greatest at the end of the inhalation period and were reasonably well maintained for one or two hours. Maximum excretion took place during the half hour following inhalation.

The wastage of material involved is from 60 to 75 per cent, but the high values obtained in the blood and urine suggest the possibility that weaker solutions can be employed for the local treatment of infections of the respiratory mucosa and adjacent tissues. According to the authors the method should prove helpful in the cure of bronchitis and bronchiectasis and as a prophylactic procedure against secondary pyococcal infections in influenza.

STEPHEN A. ZIEMAN, M.D.

Pfeiffer, C. C., Hallman, L. F., and Gersh, I.: Boric-Acid Ointment Intoxication. *J. Am. M. Ass.*, 1945, 128: 266.

Studies concerning the acute and chronic toxic effects of boric acid were carried out in rats, mice, guinea pigs, and dogs. Boric acid is absorbed in toxic quantities from ointments applied to burned areas or to wounds involving a loss or damage to large areas of skin. When a 5 per cent solution is used to irrigate cavities, most of the boric acid is absorbed by the tissues. While the drug is not toxic when administered in a single large dose, repeated doses result in accumulation in the brain, liver, and body fat. The boron occurs both in the white and gray matter of all parts of the central nervous system and in the peripheral nerves, with the largest amounts in the spinal cord and gray matter of the cerebrum. The liver is only slightly affected histologically by chronic poisoning. The kidney shows tubular degeneration, while the brain and spinal cord show neuronophagia and hyperchromatosis. The skin shows polymorphonuclear infiltration and vascular engorgement.

Pathological changes in the central nervous system are produced by as little as one-third of the median lethal dose, or by treatment of a burn involving only 4 per cent of the surface of the body with U.S.P. 10 per cent ointment. When subcutaneous doses of as little as 200 mgm. per kilogram are repeated daily, fourteen to eighteen days are required before the urinary excretion reaches a plateau. This, together with the fact that boric acid can still be found in the brain of animals four days after discontinuation of a series of doses, indicates cumulative action. In immature rats normal growth is retarded by 0.25 per cent of boric acid in the drinking water. After intravenous doses a definite increase in urinary phosphorus excretion occurs. No evidence was found of any depressant action on the blood-forming organs. In the brain the boron found is not combined with phospholipids or cholesterol. When large doses are given death is due to a shocklike syndrome. Moderate dosage given over a period of days may produce death from inanition due to convulsive tremors and meningismus. Large intravenous doses of isotonic solution of three chlorides and plasma definitely antidote the toxicity but no such effect is produced by mannitol, glucose, or glycerol.

The authors conclude that boric acid, whether applied in the form of an ointment or saturated solution to extensive wounds, is a cumulative poison. Its weak antiseptic value suggests that for medicinal use other more active and less potentially harmful therapeutic agents should be employed.

WALTER H. NADLER, M.D.

ANESTHESIA

Adams, R. C., Lundy, J. S., and Seldon, T. H.: Ten Years of Pentothal-Sodium Intravenous Anesthesia; An Evaluation of its Past, Present, and Future. *Anesthesiology*, 1945, 6: 239.

An evaluation of the past, present, and future of pentothal anesthesia is made by the "clinical fathers" of the agents. The evolution of intravenous anesthesia reflects the trials and tribulations that have beset the evolution of the science and art of anesthesiology. Pentothal anesthesia is being used thousands of times a day by physicians, dentists, nurse anesthetists, and the varied personnel of the medical corp of the armed forces. It is important to realize that it is necessary to have available most of the equipment necessary for the administration of an inhalation anesthetic when pentothal is given. Failure to keep this fact in mind has accounted for a fair proportion of the morbidity and mortality associated with intravenous anesthesia. Perhaps the most important single factor that has become apparent earlier in the development of anesthesia was the widely divergent tolerance of the patients for the drug. The agent per se is not any more hazardous than any other anesthetic in cases in which the patients are in shock. However, it is dangerous when administered according to ordinary standards and in so-called average doses. Used alone it has been considered unsatisfactory in abdominal surgery and in surgery of the throat and glottis regions. When accessory methods, such as regional anesthesia and nitrous oxide and oxygen, supplement pentothal anesthesia its field of usefulness widens. The maintenance of a clear airway was one of the earliest problems in this type of anesthesia, and it has been largely solved by the increasing use of an intratracheal tube preceded by the cocainization of the glottis. Many problems still are unsolved, such as the site of the detoxication and factors which govern the speed of detoxication of the drug.

At the present time the great popularity and extensive use of pentothal sodium is evident. Because so many untrained workers use the agent, it is important to teach its correct administration and its dangers and limitations. One must teach its use in the average case in which it is most suitable, and the

finer and more specialized applications should be left to the experienced anesthetist. A 2½ per cent solution has become routine in most places and seems to have an advantage over the more dilute solutions in that the possibility of error is lessened. The apparatus which offers the greatest opportunity is a type of extension tubing which permits singlehanded administration.

The use of the combined type of intravenous anesthesia has increased steadily from year to year, such combinations permitting reduction in dosage and in undesirable effects from the agent. The combination of pentothal and local or regional anesthesia and the intratracheal tube with the simultaneous administration of oxygen and nitrous oxide are being used extensively today.

Intravenous anesthesia as it is known today will continue to play a major role in anesthesiology. Radical future changes and developments will no doubt be dependent on the evolution of new and probably different agents. It is likely that the coming years will see pentothal sodium used in combination with more agents than it has been in the past.

MARY KARP, M.D.

Eversole, U. H.: Spinal Anesthesia. *J. Am. M. Ass.*, 1945, 128: 256.

The main contraindication to spinal anesthesia is still the lack of experience of the spinal anesthetist. Too much emphasis has been placed on the selection of the agent and the method used than the skill of the administrator. An appreciation of some of the physical and physiological factors involved in the production of adequate spinal anesthesia is of prime importance.

The principal advantage of spinal anesthesia is the attainment of working conditions in the abdomen not excelled by other methods. Disadvantages are the difficulty in obtaining sufficient height to permit work without discomfort to the patient, insufficient duration, respiratory depression, circulatory depression, nausea, retching and vomiting during operation, and psychic objection on the part of the patient and surgeon to the patients' being awake during the operation.

In order to have longer-lasting upper abdominal anesthesia the maximum concentration of the agent must be along the nerve roots supplying the upper part of the abdomen and not at the spinal puncture site in the lumbar area.

The anatomic factors involved in the distribution of the spinal anesthesia are reviewed in order to approximate the problems associated with distributing the major portion of the anesthetic agent on the nerve roots to the upper part of the abdomen and at the same time stopping the agent short in respiratory paralysis.

The factors which influence the cephalad progress of the agent include the site of injection, the volume of solution injected, the speed of injection, the amount of barbotage employed, the diffusion of and influence of gravity on the agent and the spinal fluid, and anatomic factors such as spinal curves and arachnoidal adhesions. By maintaining a constant tilt of the table with the head down from the horizontal; using an anesthetic mixture of a constant specific gravity, always heavier than the spinal fluid; and maintaining a constant rate of injection in the same lumbar interspace, the height of anesthesia can be fairly accurately determined by employing only one variable. This variable is the time that the table and patient are kept in the head down position. Clinical experiences in over 15,000 patients have shown that this method is highly applicable. Ten per cent dextrose with a specific gravity of 1.039 is the innoxious substance which is used as the diluent to make the anesthetic solution heavier than spinal fluid. One per cent pontocaine in an isotonic solution of sodium chloride is the anesthetic agent used. The desired dosage of pontocaine plus 1.5 parts of 10 per cent dextrose has a specific gravity of approximately 1.027. The third lumbar interspace is the position for the injection which is constant at 0.25 c.c. per second. The degree of the Trendelenberg position and the time the table is kept in this position determines the height of anesthesia, after which the table is leveled.

Respiratory impairment should be recognized immediately as the anesthesia progresses cephalad. The intercostal muscles become paralyzed and then the diaphragm, if the fourth cervical nerve is involved. At this point the conscious patient attempts to increase the size of the chest cavity by using accessory muscles of respiration. If this condition is not relieved hypoxia, circulatory collapse, and death may occur. Mechanical rhythmic assistance to respiration plus the administration of oxygen is the obvious treatment for this condition. This period of respiratory depression rarely lasts longer than from twenty to thirty minutes.

A fall in the blood pressure is usually treated by the intramuscular administration of a combination of 5 units of pitressin and 25 mgm. of ephedrine. In the presence of a severe fall in the blood pressure from one-fourth to one-third of this dose can be given intravenously. If the nausea, retching, and vomiting which occur during the spinal anesthesia are more than momentary, the patient should be rendered unconscious by the use of an inhalation agent or by the intravenous administration of pentothal sodium. The intravenous administration of morphine often allays apprehension and nervousness. The placing of an intravenous needle in one of the great saphenous veins near the medial malleolus permits the rapid administration of supportive fluids as needed.

With the increasing use of continuous spinal anesthesia the need for supplementary anesthesia for longer surgical procedures is disappearing.

If a control of the anesthesia is combined with the judicious use of supportive measures and supplementary agents there are few patients to whom spinal anesthesia need be denied for surgery in any part of the abdomen. MARY KARP, M.D.

Tuohy, E. B.: Spinal Anesthesia by Ureteral Catheter. *J. Am. M. Ass.*, 1945, 128: 362.

There is little doubt at the present time that fractional administration of spinal anesthetic agents is relatively safer than single large-dose administration. The chief difficulties resulting from the Lemmon technique of continuous spinal anesthesia are the dislodging of the malleable needle and breakage of the needle. In an effort to obviate the difficulty of dislodgment of the malleable needle a new method of performing continuous spinal anesthesia was devised utilizing a urethral catheter. The technique involves the insertion of the catheter, a 15 gauge, 3 to 3½ inch needle, which is placed into the subarachnoid space. A definite "snap" is felt when the needle punctures the ligamentum flavum and thence the dura and arachnoid tissue. The preliminary dose of procaine is given; then the patient is turned supine carefully. Subsequent doses are administered as indicated. For the removal of the catheter at the completion of the operation the patient is turned on his side again, flexed to relieve any tendency of the interspinous or spinous processes to impinge on the catheter, and then the catheter is gently withdrawn.

There has been no increase in the incidence of spinal-puncture headaches as compared with the single-dose spinal anesthesia or routine spinal puncture. There have been no instances of paresthesia. The number of cases reported is 250, in 2 of which the catheter was not introduced successfully. There was no instance of bladder or rectal dysfunction or evidence of infection in the subarachnoid space or in the soft tissue. Bleeding from the soft tissues at the site of injection was encountered occasionally if difficulty was experienced in performing the lumbar puncture.

The author finds that the catheter technique is attended by fewer mechanical difficulties and is less traumatic to the soft tissues than is the malleable-needle method of Lemmon. The cephalad advancement of the catheter in the subarachnoid space will usually occur after the round tip of the catheter is bent slightly before it is introduced into the lumen of the needle. If the catheter turns caudally, detection is made because of segmental distribution of the resulting anesthesia. When this occurs the anesthetic solution should be diluted with an equal volume of isotonic solution of sodium chloride and twice as much solution by volume should be administered in order to produce higher anesthesia.

The total cost of this equipment is comparatively small as compared to the cost of the equipment necessary for other methods of continuous spinal anesthesia. MARY KARP, M.D.

Pickrell, K. L., and Richards, R. K.: Pentothal-Metrazol Antagonism. *Ann. Surg.*, 1945, 121: 495.

There are two disadvantages to the intravenous use of pentothal anesthesia. One is the apparent increase in the depth of anesthesia which occurs at the termination of the operation when stimulation is no longer present, and is followed by a prolonged period of sleep. The second is the occurrence of profound respiratory depression which may be seen during any stage of the anesthesia. Pentothal produces a depression of the cerebral spinal axis, the effect varying from slight sedation to deep coma. Because metrazol has protective action against lethal doses of barbiturates, it was decided to investigate and evaluate this drug for use in the prevention of prolonged narcosis, and for the resuscitation of patients in profound respiratory depression.

A series of observations was made first on the average length of the recovery period of 80 patients anesthetized with pentothal. In a second series of more than 300 patients, studies were made of the arousing effect of metrazol given intravenously at or near the close of the operative procedure.

The average recovery period for patients in the first group was three and one-half hours for those with well mobilized operative sites and two hours for those with poorly immobilized operative wounds.

In the second group, 5 c.c. of metrazol were given intravenously at the close of the operation and in some instances an additional 3 c.c. were given. In all but 16 instances, recovery took place either immediately or within from thirty to forty-five minutes after the patient was returned to the ward.

A detailed report was made of the restorative effect of metrazol in 6 patients with marked respiratory depression.

Experimental studies on animals clearly demonstrated that it is possible to interrupt completely and permanently a profound pentothal anesthesia in rabbits by the intravenous administration of metrazol. Also, a marked and constant reduction of the recovery time was shown.

The authors discuss the pharmacology and the effects of metrazol. Its action on the medullary centers and its nontoxicity were stressed. The effects of metrazol usually last from one-half to one and one-half hours; it is rapidly detoxified and it is not cumulative. Its action is greatly dependent on the time of administration with respect to the introduction of the barbiturates. In man, both from the point of view of the arousing effect of metrazol and its action in stimulating the resumption of respiration in acute depression, the results of its use were most striking and occasionally dramatic.

The use of metrazol is not recommended as a routine procedure, but only in those cases in which indications for it are evident. MARY KARP, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Penhale, K. W.: Acrylic Resin As An Implant for Correction of Facial Deformities. *Arch. Surg.*, 1945, 50: 233.

Implants, foreign or otherwise, have their place in the reconstructive field of plastic surgery. In the past, the materials used as implants were chiefly bone or cartilage. Their use dates back to about 1861, when rib grafts were made to supply the skeletal

Fig. 1. Left, Deformity of chin due to bilateral ankylosis. Surgically corrected in 1936. Patient wearing acrylic resin implant inserted at will in labial sulcus previously lined with epithelium from thigh. Right, Cast of face before correction.

Fig. 2. Left, Congenital underdevelopment of mandible. Right, Four months after acrylic resin was implanted through external incision under chin. This implant is buried under the soft tissues over the symphysis of the mandible.

framework of a reconstructed nose. Other materials that have been used include bovine cartilage, ear, rib, and septal (autogenous) cartilage, and homocartilage.

To determine the value of acrylic resin for grafting, clinically as well as microscopically, pieces of known satisfactory grafts were implanted under the skin of a monkey together with a piece of acrylic resin under careful aseptic conditions. These grafts, together with the surrounding tissue, were removed after seven days for microscopic examination. One might conclude that the acrylic resin produced less inflammatory infiltration in the early stages and yet a satisfactory fibrosis.

The author believes it advisable to instruct patients before and after operation that acrylic-resin implants may produce inflammatory changes at some future date. In the event that such noticeable reactions occur, they are advised to have the grafts removed. In the author's experience with this material for over a period of about three years, no person has had any untoward clinical effects. However, not until such an implant has been embedded for ten or twenty years is one prepared to state the final outcome. Further investigation is warranted, as there are unlimited possibilities for use of this material in reconstructive surgery. It may be advisable to bury metal in the acrylic resin implant, so that in case of future traumatic injuries the graft will be radiopaque to the roentgen rays.

LOUIS T. BYARS, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Holvey, E. H., Rosenthal, L. M., and Anson, B. J.: Tomography of the Skull. *Radiology*, 1945, 44: 425.

Tomography, or body-section roentgenography, is being used since about 1930, and is gradually but steadily gaining new advocates. The method is especially valuable in the examination of the skull, larynx, and thorax.

In 1938 Leborgne visited the United States and assisted in the design and construction, at the Chicago Tumor Institute, of a tomographic apparatus similar to one that he formerly built in Uruguay. This apparatus has been adequately described by Caulk elsewhere.

The authors studied the tomographic sections of the skull at various levels in different views and compared them with corresponding anatomic sections. Cadaver heads in relatively good states of preservation were used. One head was placed in the posteroanterior position and another in the right lateral and left lateral positions on the roentgenographic table, and tomograms were made at 0.5 cm. levels from 3.5 to 10.5 cm. from the table top. Then the heads were sectioned anatomically, the first in the coronal and the second in the lateral planes, in an attempt to duplicate as much as possible the tomographic levels. Due to technical difficulties in cutting it was thought best to obtain the anatomic sections only at approximately 2 cm. levels. In the posteroanterior view the sections were carried to a point just beyond the sphenoid sinuses since it was believed that the remaining sections would not disclose anatomic structures warranting a detailed description.

The roentgenographic factors were as follows: (a) for posteroanterior tomograms: from 65.2 to 74.2 kv.p., 100 ma., 40 inches distance, 2 seconds exposure, the kv.p. increasing in inverse proportion to the distance from the table top; (b) for lateral tomograms: from 58 to 65.2 kv.p., 100 ma., 40 inches distance, 2 seconds exposure, the kv.p. increasing as in the posteroanterior view.

The authors give a detailed description of all tomographic and anatomic sections at various levels, using certain bony landmarks of the skull as guiding points. Altogether 38 figures are used for the purpose of illustration.

These studies of the normal skull are valuable since they furnish the basis of comparison with pathological states. T. LEUCUTIA, M.D.

Lowman, R. M., and Doff, S. D.: Arteriography for the Demonstration of Intracranial Aneurysms. *Am. J. Roentg.*, 1945, 53: 341.

Egaz Moniz, in 1927, introduced intracranial arteriography, and in 1933 he reported the first demonstration of an intracranial aneurysm of the right internal carotid artery by means of this method. Since then, many similar reports have appeared in the literature.

In the beginning, thorotrast had been advocated generally as the most suitable radiopaque medium. However, it was soon suspected that apart from its rather frequent toxicity and debatable radioactive effect, thorotrast causes an injury to the walls of the vessels leading to actual occlusion. Ekstrom and Lindren, for example, noted cerebral thrombosis in 60 per cent of the brains which came to necropsy after intracarotid injection of thorotrast. Later, therefore, diodrast, neoskiodan, uroselectan, and other preparations made for excretory urography were substituted without untoward effects. The authors themselves, despite the fact that they have never observed any harm from the thorotrast, are now using a 50 per cent solution of diodrast compound with good result.

Numerous procedures have been devised for taking rapid serial angiograms, the best known among them being Moniz' "merry-go-round." Since the examination is carried out in the operating room, the authors employ a simplified technique utilizing a portable roentgen apparatus. Provision is made for the rapid taking of lateral roentgenograms, inasmuch as this view has proved to be of greater value in the demonstration of aneurysm. The factors used are: 35 inches skin target distance, 80 kv., 25 ma., and ¼ second exposure without grids. A preliminary roentgenogram is made to ascertain the correct positioning of the patient and then the visualization of the intracranial circulation is carried out by injecting the internal carotid or vertebral arteries, under proper aseptic conditions. Subsequent roentgenograms are made after approximately three-quarters of the solution has been introduced at intervals of three seconds, the final exposure being made at the end of twelve seconds. The injection is performed by the neurosurgeon. Certain skillful procedures insuring the success of a rapid injection are described.

The authors' experience extends to 15 cases. In order to demonstrate the difficulties concerned in the diagnosis of an intracranial aneurysm, they describe a case in detail and present the angiograms in question.

The preoperative diagnosis was indefinite. On the fifty-first hospital day, angiography was done. Inasmuch as this revealed the presence of an aneurysm arising from the internal carotid artery near its junction with the middle cerebral artery (the so-called supraclinoidal type, according to Moniz), the internal carotid was ligated. An immediate improvement of the physical signs resulted and at present, two and one-half years later, the patient is entirely well. T. LEUCUTIA, M.D.

Nelson, O. A.: Arteriography in Renal and Abdominal Conditions. *J. Urol.*, Balt., 1945, 53: 521.

The author describes his experience of injecting the abdominal aorta for the purpose of arteriography. In the main, the technique devised by Santos and his coworkers was used. It is important that a concentrated opaque solution be injected rapidly and that roentgenograms be made as quickly as possible, since the opaque medium is moving swiftly.

A special pressure apparatus supplied with an 18 gauge needle 12 cm. long is used for the purpose of injection. The roentgen apparatus must deliver 500 ma. of current since the exposure is made in one-fourth of one second. An 80 per cent solution of sodium iodide is employed as a contrast medium.

On the afternoon before the examination the patient is given 2 oz. of castor oil in 3 or 4 oz. of root beer; then he is allowed only liquid nourishment until after the examination. The injection is done under sodium-pentothal anesthesia. The needle is inserted just below the twelfth rib and about 3 or 4 fingers' breadth to the left of the spinous processes. The point is directed inward and downward toward the body of the twelfth vertebra and, after the bone is reached, is deviated laterally so as to glide over the vertebra. Then the stilet is withdrawn, the needle is slowly advanced a few centimeters until blood is coming through, the pressure apparatus is attached, and 6 or 8 c.c. of the contrast solution are allowed to run into the aorta. The roentgen exposure is made immediately after the completion of the injection. Finally, the pressure apparatus is disconnected, a few cubic centimeters of blood are allowed to escape, and the needle is withdrawn.

There are 3 possible complications: (1) acute iodism, which may be avoided by the administration of a mildly hypertonic solution, such as 1,000 c.c. of 5 per cent glucose in normal saline solution with 200 units of vitamin C; this is given immediately after the patient has been returned to bed; (2) extra-aortic injection of the contrast medium, which, according to Santos, is of no serious consequence, as the solution will be absorbed spontaneously; and (3) extravasation through the needle puncture, the occurrence of which has not been observed either by the author or Santos. This is due, no doubt, to the ruggedness of the aortic wall. Therefore, a properly performed aortic puncture carries no more hazard than a spinal puncture or a cystoscopy.

The author also tried skiodan and a 70 per cent diodrast solution as opaque media. Although the iodine content of these substances proved too small for arteriography, two interesting side-observations were made: (a) diodrast produced quite dense shadows of the renal parenchyma, which the author calls "renogram," and (b) by injecting about 40 c.c. of 70 per cent diodrast into the aorta excellent secretory pyelograms were obtained.

Arteriography of the abdominal aorta gives valuable information in (1) location of the organs, (2) arterial obstruction, (3) aneurysm, and (4) renal neoplasm. Five cases are described, and their respective roentgenograms are reproduced. The author's experience extends to 106 cases, without serious untoward effects. T. LEUCUTIA, M.D.

Morrison, M. C.: Roentgenological Findings in Lesser-Sac Effusion. *Canad. M. Ass. J.*, 1945, 52: 474.

There is a paucity of reports in the literature on the roentgen findings of effusion in the lesser peritoneal sac. Two cases are reported by the author, with the following, pertinent, roentgen findings:

1. A direct shadow caused by fluid collection in the lesser sac
2. A variable degree of deformity of the pancreatic duodenal loop
3. Extrinsic pressure signs on the lesser posterior wall of the stomach
4. Displacement of the stomach inferiorly and to the left; the stomach remains pliable on fluoroscopic palpation
5. Preservation of the renal outline
6. Chest findings similar to those of any other lesion involving the subdiaphragm

Lesser-sac effusions should be differentiated from retroperitoneal tumors, pancreatic cysts, omental cysts, and subdiaphragmatic abscess.

In order to arrive at a quick, accurate diagnosis, it is essential that roentgen studies of the chest (anteroposterior and lateral), abdomen, and upper gastrointestinal tract be done. MAURICE D. SACHS, M.D.

Grossman, J. W., and Minor, H. H.: Roentgen Demonstration of the Semilunar Cartilages of the Knee. *Am. J. Roentg.*, 1945, 53: 454.

The semilunar cartilages of the knee joint may be visualized roentgenographically by injecting radiolucent (gas, usually air) or opaque (iopax, sodium iodide) contrast media, either singly or in combination. Another procedure, without contrast media, is the roentgenography of the knee joint in forced abduction. By the latter procedure it is possible to demonstrate satisfactorily the medial meniscus in about 70 per cent of the cases, but the lateral meniscus is visualized rarely.

The authors, by combining the injection of a small amount of air with forced abduction of the knee joint during roentgenography, were able to visualize both of the semilunar cartilages satisfactorily.

The technique is simple and can be performed in any roentgenographic room without hospitalization of the patient or any special preparation. The injection is made just lateral to the patellar ligament through the ligamentum mucosum, following infiltration of the skin and superficial subcutaneous tissues with 1 per cent novocain, although lately the local anesthesia is dispensed with altogether. The patient is in the supine position with his legs hanging down over one end of the roentgenographic table. After the fluid has entered the joint, as much as possible of it is withdrawn; if much is present, then from 10 to 20 c.c. of atmospheric air filtered through

several thicknesses of sterile gauze are injected slowly, the needle is withdrawn and the puncture is sealed with collodion. For the application of the forced abduction during roentgenography the authors constructed two simple additions to their equipment: (a) a device for immobilizing the knee joint while lateral traction is exerted on the leg and thigh, and (b) a device for applying the lateral traction. These are briefly described.

After the air is injected the patient is placed in the prone position. The necessary immobilization is made and the traction exerted by a maneuver which permits suction of the injected air into the side which is being forcibly abducted. By this procedure, the semilunar cartilage on this side of the joint is visualized. Then the immobilizing and traction devices are switched to the opposite side and the same maneuver is repeated to visualize the other semilunar cartilage. Both medial and lateral compartments of the knee joint are roentgenographed in the prone and supine positions. To insure a better distribution of the air it is necessary to take certain precautions in the positioning of the patient, which are described. In this manner, it is possible to demonstrate all parts (anterior, lateral, and posterior horns) of the lateral and medial semilunar cartilages, and, at times, even the cruciate ligaments.

The following are the clinical advantages of visualization of the semilunar cartilages: (1) it will permit the recognition of a pathological meniscus; (2) it will indicate which cartilage is affected; (3) it has led to the establishment of two important facts—(a) the lateral meniscus is fractured more often than is generally believed, and (b) in many cases both cartilages are demonstrated to be pathological; (4) it makes possible the estimation of the degree of damage to each meniscus, especially as it refers to marginal tears; and (5) it may show cruciate ligament tears and pathology of the articular cartilage. Numerous roentgenograms are used for illustration.

T. Leucutia, M.D.

Kerr, H. D., and Einstein, A. J.: Results of Irradiation of Ovarian Tumors. *Am. J. Roentg.*, 1945, 53: 376.

The authors believe that carcinoma of the ovary is treated best by combined surgery and radiation therapy. During the period from 1930 to 1938, 100 patients were treated; 62 were between forty and sixty years of age. Those living were observed for from sixty to one hundred and fifty-five months.

Four clinical groups were used in classifying the stage of the disease, viz.:

Group 1 was composed of 21 patients in whom the entire primary tumor had been removed; group 2 was composed of 48 patients in whom there had been (a) partial removal of the tumor or of visible metastases, and (b) ascites and malignant cells; group 3 included 8 patients with a recurrence of malignancy; and group 4 included 17 patients with inoperable tumors.

In 73 patients the tumor had progressed to such an extent that treatment by surgery alone was insufficient.

Ascites was present in 25 patients.

Surgery was done in 94 cases. In 46 cases the tumor was unilateral, in 30 bilateral, and in 24, no information was available concerning the tumor site.

The pathology was available in 98 cases. In 91 patients the tumors were malignant, and in another 2 they were potentially malignant; in 2 cases benign neoplasms, and in 3 cases non-neoplastic lesions were present.

In 47 cases papillary cystadenomas were present.

The remainder of the tumors were divided as follows: 5 carcinomas, 21 adenocarcinomas, 9 pseudomucinous cystadenomas, 1 dysgerminoma, 1 teratoma, 1 malignant dermoid cyst, and 1 epidermoid carcinoma.

Irradiation was administered postoperatively to 92 patients and preoperatively to 7 patients. Of the 7 tumors which had been irradiated preoperatively, 3 were classified clinically as inoperable; however, following irradiation these became operable. Three of the 4 remaining patients had non-neoplastic lesions. All patients were treated at high voltage; i.e., 200 kv.p., 0.5 mm. of copper plus 1.0 mm. of aluminum, or Thoraeus filtration at 5, 8 or 20 ma., 50 cm. distance, and 200 roentgens to each of two fields daily for a total dose of 2,000 roentgens per field. Beginning in 1936, two 10 x 15 cm. lateral fields were added. Twenty-five patients received from 2 to 3 cycles of therapy.

Therapy was limited only by the skin tolerance, and the average tumor dose per cycle was between 2,000 and 3,000 roentgens.

Of the 91 patients with malignant neoplasms, 38 (40 per cent) lived five years, and 4 of the 25 patients with ascites survived for a period of five years or more.

The authors emphasize the fact that early recognition of ovarian carcinoma will increase the survival rate; also, that no set routine can be applied to any given case—the treatment of each case should be individualized.

The results obtained in this series of cases are in accord with those of other authors. The combined use of surgery and radiation resulted in a slight improvement in the five-year survivals in group 1, and in marked improvement in groups 2, 3, and 4.

Maurice D. Sachs, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Kemper, M., and Gibson, S.: Accidental Hanging with Recovery. *J. Pediat.*, S. Louis, 1945, 26: 401.

A study of the reported cases of hanging with recovery records a strikingly consistent clinical course. The symptomatology usually includes unconsciousness and cessation of respiration for a time, followed by violent convulsions and irrationality, tachycardia, rapid respirations, dysphagia, aphonia, incontinence of urine and feces, dilated pupils, elevation of the temperature for several days after the hanging, and complete amnesia of the event and of the period from three to ten days prior to the event. Recovery is almost always complete, without residual damage, in from three to fourteen days. The treatment is largely supportive, including immediate administration of oxygen by tent or nasal catheter, hypertonic glucose given intravenously, and sedation with phenobarbital. The phenobarbital should be continued in small daily doses for many months after clinical recovery.

The effects of hanging are threefold: (1) the air passages are shut off; (2) pressure is applied to the main blood vessels; and (3) the phrenic and vagus nerves may or may not be crushed. The second effect is probably the most important single factor. The obstruction to breathing contributes to the cerebral anoxemia, and the complete cessation of respiration is of major importance in whether or not suicidal or accidental hanging victims can be revived.

Two cases of accidental hanging in children, with recovery, are reported. SAMUEL KAHN, M.D.

López, L. M., and Longo, O. F.: The Proteins of the Plasma in Hepato-Obstructive Icterus (Las proteinas del plasma en las ictericias hepato-obstructivas). *Arch. argent. enferm. ap. digest.*, 1944, 19: 323.

The normal seroglobulin index in the plasma is from 1.5 to 2.0 gm. per thousand. If it falls to less than 1 it indicates a serious disturbance of liver function which may be manifested clinically by suppression of urine, postoperative distention of the abdomen, edema, or failure of the wound to heal.

The authors studied 22 cases of icterus which they divided into three groups—those due to hepatitis or hepatosis, those due to anatomical obstruction, and those due to obstruction by stones. Proteinemia was examined by means of the bilirubin, phosphate and Hanger tests, and sedimentation of erythrocytes in all cases, and in some also by the galactose and hippuric-acid tests. Tables are given showing the details of the results of these tests in the three groups of cases.

In 3 of the cases (13 per cent) the seroglobulin quotient was normal; in 13 per cent sedimentation of the erythrocytes was normal. Phosphatemia was normal in only 6 patients (27 per cent). The Hanger test was negative in 18 per cent. Among 7 patients in whom the excess carbohydrate test was made it was normal in 2 (28 per cent). Only 40 per cent of the patients were operated on. The mortality in the whole series was 18 per cent (4 patients).

It is evident that in icterus, whether functional or anatomical, there is a serious defect in the liver which can be shown by various functional tests; it is a condition of functional deficiency which acts on the proteins of the plasma and is shown by hypoalbuminemia with inversion of the seroglobulin quotient.

The authors treated liver function in their cases by giving diets rich in carbohydrate, liver extract, and vitamins, and small transfusions of blood both before and after operation.

AUDREY G. MORGAN, M.D.

Hirshfield, J. W., Abbott, W. E., Pilling, M. A., Heller, C. G., and Others: Metabolic Alterations following Thermal Burns; Effect of Variations in Food Intake on the Nitrogen Balance of Burned Patients. *Arch. Surg.*, 1945, 50: 194.

The authors' studies were made to obtain more information about the change in protein metabolism in burned patients. The correlation of the nitrogen balance in patients on various diets with the urinary excretion of 17-ketosteroids, cortinlike substances, gonadotropins, and estrogens was undertaken. It was found that only rarely do burned patients have a desire for more than minimum quantities of food. The 23 patients were able to consume a diet slightly above their basal caloric requirement, but frequently when larger quantities of food were given, nausea, vomiting, diarrhea, and mental confusion resulted. These symptoms were usually encountered in the first week. They occurred regardless of the type of food but were most pronounced in patients receiving a synthetic diet by tube. Whether the symptoms were produced by excessive amounts of amino acids, calories, or water is not known. Sometimes these patients vomited enough to lower materially their caloric and nitrogen intake, a circumstance that necessitated a revision of their diet. For these reasons the protein, carbohydrate, and caloric intake of the patients, especially those who had forced feeding, was not as constant as desired.

All of the patients excreted abnormally large quantities of nitrogen in the urine. Except for a few who received abnormally large quantities of protein and carbohydrate, all were in negative nitrogen balance. The negative balance was usually most pronounced during the first ten days and gradually decreased thereafter. The patients who were in pronounced negative nitrogen balance lost weight, and some became visibly emaciated. The nitrogen deficit did not reflect the changes in weight. A tabulation of data on protein metabolism in the 23 patients is given.

Although it was possible by means of a high caloric and protein intake to prevent excessive loss of nitrogen and weight, the clinical course of the patients seemed to leave little doubt that forced feeding with the type of diet employed is undesirable, at least during the first ten days after injury.

It was considered that most burned patients, if allowed to eat only what they desire, do not consume an adequate diet. Hence it is important, after the shock phase of the injury has passed, to insist that they eat sufficient food to maintain proper nutrition.

STEPHEN A. ZIEMAN, M.D.

Kent, G. T., and Diefendorf, H. W.: A Clinical Study of Sensitivity to Sulfathiazole. *Am. J. M. Sc.*, 1945, 209: 640.

Untoward reactions to sulfonamide drugs may be classified as follows: (1) direct toxic effects such as vomiting and cyanosis, (2) mechanical effects due to precipitation in the urinary passages, (3) allergic reactions—hypersensitivity, such as drug fever and eruptions.

The authors' study was made with a view to determining the time of appearance of certain allergic reactions upon primary administration of the sulfathiazole, as well as the incidence and time of onset of allergic reactions after the readministration of sulfathiazole.

Primary administration. Of 472 patients who received 1 course of sulfathiazole, 110 exhibited some form of reaction, viz., nausea and vomiting in 15 per cent, drug fever in 8.05 per cent, skin rash in 2.97 per cent, erythema nodosum, conjunctivitis, renal complications, anemia, leucopenia, leucocytosis, delirium, arthralgia, and soreness of the balls of the feet. Forty-six patients, or less than one-half of the group, exhibited reactions which had to be considered as due to sensitivity, and of these, 38 had drug fever. The fever occurred between the first and the eleventh days, with a sharp peak of incidence on the ninth day.

Readministration. One-hundred and three patients received sulfathiazole on two occasions. The interval between the two courses was from two to one-hundred and eighty days. Of these patients, 22 exhibited sensitivity reactions. All who developed drug fever reactions on the first administration of sulfathiazole, again developed drug fever within two days after readministration. The total incidence of drug fever was more than twice that which occurred in the group of patients who had received but 1 course of treatment. The shortened period of time in which severe drug fever appeared (the second day of readministration) points toward sensitization. No such sensitization was manifest upon readministration unless nine days had elapsed from the beginning of the first course of treatment. Single or total dosage had no influence on the incidence of reactions.

The data presented by the authors strongly support the thesis advanced by Longcope, that these allergic reactions belong in the same class with serum sickness.

The increased number of individuals who were sensitive on readministration, the earlier appearance of drug fever, and the minimal interval of nine days necessary for its development are presented as indications that sensitization is produced by the initial dose of sulfathiazole.

ARTHUR J. LESSER, M.D.

Black-Schaffer, B.: The Pathology of Anaphylaxis Due to Sulfonamide Drugs. *Arch. Path., Chic.*, 1945, 39: 301.

The universal use of sulfonamide compounds and the discovery that they may act as antigens capable of eliciting fatal reactions have, for the first time, made possible the study of a large number of relatively slow but fatal anaphylactic reactions. Five cases of anaphylactic death following the therapeutic use of sulfonamide compounds are presented in this report as well as an interesting and comprehensive résumé on the theory of anaphylactic shock. Emphasis is placed upon the fact that allergic reactions can be elicited by nonprotein drugs.

In general, the 5 cases were characterized by two related lesions, arterial changes, and generalized cellular exudate. The arterial lesions differed in appearance but all were reflections of a linear progression from simple edema to frank necrosis. The cellular exudate, which invaded the connective tissue of the skin, the renal pelvis, the mediastinum, the gastrointestinal tract, and other organs, was similar in all respects to that seen in the smaller arteries. Its most prominent component was a macrophage possessing a large amount of cytoplasm and displaying active phagocytosis. Its nucleus was eccentrically situated and it sometimes resembled a plasma cell so closely that only the presence of transitional types and the phenomenon of phagocytosis made differentiation possible. It was apparent that the arterial lesions and the composition of the cellular exudate observed in the reaction of these patients, following the administration of sulfonamide compounds, were similar to those seen in experimental anaphylaxis.

The theory is presented that the leucophagocytosis and the erythrophagocytosis represent a form of "foreign-body reaction" in which the homologous blood cells are so changed by the addition of a substance (perhaps a conjugated [sulfonamide] group) that they become alien to the protein pattern of the patient. Such a change may conceivably convert the erythrocytes or the leucocytes into allergens capable of eliciting the production of specific antibodies, which leads to anaphylactic shock.

SAMUEL J. FOGELSON, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Frazer, A. C., Elkes, J. J., Sammons, H. G., Govan, A. D. T., and Cooke, W. T.: Effects of Clostridium Welchii Type A Toxin on Body Tissues and Fluids. *Lancet*, Lond., 1945, 248: 457.

Clostridial infection tends to spread along fascial planes. The involvement of muscle probably fa-

cilitates the rapid spread of clostridial infection and the development of a fulminating toxemia. It seems probable that the essential requirements for the development of a severe clostridial toxemia are the provision of a good environment for the growth of the organism and a supply of suitable food material for the production of potent enzymes. Phospholipid may play an important part in oxygen carriage, especially in active tissues such as muscles. An anaerobic environment is essential for clostridial growth, and it is suggested that the rapid removal of phospholipid from muscle by lecithinase will help to produce favorable conditions for the growth of anaerobic organisms.

Clostridium welchii toxin causes rapid destruction of the red blood cells; hemolysis may occur clinically, but whether this is due to any direct action of lecithinase, or is caused by the products of tissue breakdown has not yet been established. The other changes in the blood consist of flocculation of chylomicrons and the breaking of lipoprotein complexes.

The occurrence of demyelinization in the central nervous system is an effect of lecithinase, or it may be secondary to fat embolism. It is impossible to demonstrate free toxin in the blood stream even though more remote effects are taking place. This may be due to a concentration in the blood too low for detection by the methods available, and to the subsequent fixation of the toxin in the nervous system with a cumulative effect, or there may be a masking effect of the circulating toxin in the blood.

Clostridial fat embolism is of interest because it may be important in the pathology of clostridial infections, and because it may throw some light on the mechanism by which fat embolism can occur in other surgical conditions. The embolic fat may originate in the free fat which is liberated from adipose tissue and muscles, and can be seen as large globules in in-vitro studies, and in the material from the site of tissue destruction; or it may originate from flocculated chylomicrons and the fatty material set free from broken lipoprotein complexes. Experimentally, there seems to be no doubt that the fat must be derived from the site of local destruction. The precise mechanism by which the fat globules enter the blood stream is still not clear. The origin of the fat in human subjects is more difficult to determine, especially since some of the cases also present fractures. Extensive fat embolism, however, definitely occurs in human beings who have no fractures. Whether or not flocculation of fat particles and the breaking down of lipoprotein complexes are important contributors to the clostridial fat-embolism syndrome in man is still a moot question.

SAMUEL KAHN, M.D.

Lapenta, R. G., Weckstein, A. M., and Sarnoff, H.: Standardized Dosage of Penicillin. *J. Am. M. Ass.*, 1945, 128: 168.

The present report appears to be the first in the literature of a study which reveals the rapidity of bacteriological cure based on serial cultures following each dose of penicillin in the treatment of gonococcal urethritis. This study was undertaken with a view to determine the exact point of bacteriological cure within the limits of the units of penicillin used.

After a culture study of several thousand cases at a naval hospital the authors have found that clinical cure is not necessarily an indication of bacteriological cure in gonococcal urethritis. They have found that smears are not a very reliable means of establishing diagnosis and demonstrated that cultures are far more dependable for this purpose; likewise some cultural methods are superior to others.

In 1944 Miller, Scott, and Meller stated that the total amount of penicillin required did not exceed 100,000 units, and that all cases responded to penicillin and were cured from a clinical and bacteriological standpoint within forty-eight hours. The authors found their observations at variance with this report. For some time they observed that a considerable number of their patients with gonococcal urethritis were being readmitted after having received the standardized dosage of penicillin (100,000 units). Each of these individuals had been discharged as clinically and bacteriologically cured. Since all of them had been restricted for twenty-one days following penicillin therapy none were reinfections. All of the patients had reported back within this twenty-one-day period. A preliminary attempt was made by the authors to test their observations. Cultures were taken on a whole-blood hemolyzed blood-plasma agar medium in 73 cases. In all of these cases 100,000 units of penicillin had been injected intramuscularly in doses of 20,000 units every three hours. A culture was taken in each case on the second, seventh, and fifteenth days after therapy. This preliminary study showed 13 bacteriological failures (17.8 per cent) at varying periods of time following therapy.

In order to verify these preliminary observations an investigation was made to test the efficacy of the total 100,000 units of dosage. One hundred and thirteen patients with gonococcal urethritis, who were either sulfonamide-sensitive or harbored sulfonamide-resistant strains of the gonococcus, received penicillin in doses of 20,000 units, injected intramuscularly, until each patient had received a complete dosage of 100,000 units. A prostatic culture was taken in each case on admission to the ward and before penicillin therapy was initiated to verify the diagnosis. Urethral cultures were then taken three hours following the initial dose and before each succeeding dose of 20,000 units. Following the injection of the fifth, or final, dose of penicillin a prostatic culture was taken. If this final prostatic culture was negative and the patient appeared to be clinically cured, the patient was discharged to duty. However, only light duty was permitted for a period of ten days. In addition, each patient was recalled for prostatic cultures on three successive weeks, but on varying days. A constant supervision was possible in each case since each patient was under restriction for twenty-one days, without possibility of

re-exposure. If a patient returned with a positive bacteriological culture, the same routine was followed and serial cultures were made until each patient was definitely judged to be bacteriologically cured with 3 negative prostatic cultures over a period of twenty-one days following the last dose of penicillin. All of these cases were treated in a single ward and were directly under the authors' supervision.

In order to check the findings in the experimental group of 113 cases, a study of 106 cases of gonococcal urethritis being treated with penicillin in several outlying dispensaries was included in this investigation. It was arranged to take cultures of the 106 cases following therapy with 100,000 units of penicillin administered in the same way but without serial cultures. In each case prostatic cultures were taken during the twenty-one-day restriction period. For bacteriological cure three negative cultures over a period of twenty-one days were required. If a patient showed a positive prostatic culture, he was returned to a dispensary for additional therapy.

The results of the experimental study with the serial cultures of the 113 patients with gonococcal urethritis show that contrary to some previous experimental reports, the dosage of 100,000 units of penicillin does not insure a 100 per cent bacteriological cure. Only 70 per cent of the patients were bacteriologically cured with 100,000 units. With increased dosages 89 per cent were cured with 200,000 units, 97 per cent with 300,000 units, and one patient was cured with 460,000 units. After the use of adequate doses of penicillin no bacteriological failures were encountered. Moreover, in the three-month period during which this study was being conducted, not a single readmission from this experimental group was noted following the three negative cultures made over a period of twenty-one days. The results clearly demonstrate that positive cultures for the gonococcus may appear from two to nineteen days following inadequate therapy with penicillin.

Further analysis showed variation in the effect of penicillin in negro and white patients. This analysis pointed out that 67.2 per cent of the white males and 75 per cent of the negro males were cured with the 100,000-unit dosage.

The results in the 106 cases in the outlying dispensaries substantiate this experimental study. Here the cases cured with 100,000 units of penicillin amounted to only 67 per cent. Of the cases requiring more than 100,000 units, 17 per cent showed positive cultures fifteen days following therapy.

An interesting set of illustrations from photographs is contained in the article. They show the effect of penicillin as revealed by serial cultures on a patient with gonococcal urethritis. These culture plates are shown after the administration of 20,000 units, 40,000 units, 60,000 units, 80,000 units, and 100,000 units, respectively. These successive cultures show a decrease in the number of colonies following penicillin therapy and an increase in the size of the colonies with the reduction in numbers. As stated, the increased dosage is obligatory if definite results are expected.

MATHIAS J. SEIFERT, M.D.

Heatley, N. G.: The Administration of Penicillin by Mouth. *Lancet*, Lond., 1945, 248: 590.

While the administration of penicillin by mouth, with egg, may be effective in treating some infections, e.g., gonorrhea, the total dose necessary would seem to be at least three times that now employed for injection.

It is suggested that new methods of administration should be tested by accurately following their effect on the course of blood and urine concentrations, before the additional variations inherent in a clinical trial are considered. It is possible that more effective means may be found for the oral administration of the drug, but at present there is no reason to believe that the necessary dose will not be greater than for the parenteral methods.

CHARLES BARON, M.D.

DUCTLESS GLANDS

Bissell, G. W., and Williams, R. H.: Hirsutism in Females; A Clinical Study of Its Etiology, Course, and Treatment. *Ann. Int. M.*, 1945, 22: 773.

Normal human hair production is apparently the result of inherent qualities within each hair follicle and of endocrine influences. Although hirsutism in females is often associated with anterior pituitary, adrenocortical, and ovarian disease, especially of a neoplastic character, the majority of hirsute women demonstrate no such abnormality and are classed as examples of "idiopathic" hirsutism.

The authors report in some detail 29 cases of "idiopathic" hirsutism. Twenty-four of the women had heavy beards requiring daily shaving. Clitoral enlargement was present in 11. Thirteen had menstrual abnormalities. Obesity was present in the majority. Glucose-insulin-tolerance tests were abnormal in 19 cases, suggesting the possibility of an insulin-resistant type of carbohydrate defect. The 17-ketosteroid excretion was normal or subnormal in the majority of the cases. Case histories of 3 patients, including a metabolic balance study of 1 patient, are given. A case of pseudohermaphroditism is recorded in detail and 1 of hirsutism with acromegaly, with autopsy findings, is reviewed.

WALTER H. NADLER, M.D.

Pratt, J. P., and Schaefer, R. L.: Sex Precocity, Virilism, and Adrenal Cortical Tumor. *Am. J. Obst.*, 1945, 49: 623.

The clinical manifestations of sex precocity, virilism, and adrenal cortical tumor vary considerably but the factors common to all of them are symptoms appearing in early childhood. The patients were all females and they presented premature sexual development, virilism, rapid growth, evidence of disturbance of adrenal function, and normal gonads;

there was no evidence of tumors in the region of the third ventricle or pineal gland in any of the cases and no increase in androgens or estrogens.

Pseudohermaphrodism was eliminated from the diagnosis because the children were normal at birth. In the first case the adrenal tumor might have been present at birth, although no symptoms occurred until the third year of life. In the second case the metastatic tumor in the adrenal gland could not have preceded the visible lesion on the cheek which was discovered at the age of four months. In the third case the time of increased adrenal activity was indefinite, the signs of virilism were less conspicuous, and the diagnosis of virilism might be questioned.

Sex precocity is more frequent in the female. Virilism in the female signifies sex reversal and is comparable with sex precocity in the male. It was manifested in all 3 patients by a change of voice, hirsutism, an enlarged clitoris, a masculine contour, and masculine behavior.

Regarding the operative approach to a suspected adrenal tumor, the abdominal incision offers several advantages. If the lumbar route is used, both sides must be opened to locate the tumor and to insure that one adrenal gland is normal, but other viscera cannot be explored. A small incision at the level of the umbilicus permits exploration to determine the location of the lesion. If an arrhenoblastoma is found in an ovary, the incision can be extended downward to expose the ovary satisfactorily. If an adrenal tumor is found, the incision may be extended upward and the adrenal gland can be approached satisfactorily. Thorough exploration affords valuable information that would be lacking if the lumbar route were used. EDWARD L. CORNELL, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Puente Duany, N.: Papillary Cystadenolymphoma of the Salivary Glands (Cistoadenolinfoma papilar de las glandulas salivares). *Arch. cubanos cancerol.*, 1944, 3: 173.

A man of forty-three years entered the author's service at the Radium Institute with a small nodule in the right maxillopharyngeal space which showed the characteristics of a simple solitary adenopathy. He had noticed the nodule six months before; it was hard and he thought it was dental adenitis. This diagnosis was accepted and 300 roentgen units were given without effect, after which the tumor was removed surgically.

Microscopically it was made up of many cavities of different sizes with papillary projections covered with stratified cylindrical epithelium. In some places there seemed to be vibratile cilia. At one place the tumor tissue was mingled with the normal parotid tissue. The stroma of the tissue contained a large amount of lymphoid tissue and germinative areas. These characteristics showed that it was a cystadenolymphoma.

The history of this subject is reviewed and a table of 60 cases from the literature given. Brief histories of 42 of these cases and an extensive bibliography of the subject are presented. Altogether about 80 or 90 cases have been published.

These tumors generally originate in the parotid gland, but may originate in the submaxillary gland or the upper part of the lateral region of the neck. Their histology is described in detail and illustrated with photomicrographs. AUDREY G. MORGAN, M.D.

Leborgne, R.: Intracanalicular Biopsy in Pathological Processes of the Mammary Gland (Biopsia por vía endo canalicular en los procesos patológicos de la glándula mamaria). *Arch. gin. obst.*, Montevideo, 1944, 3: 331.

The author describes a method of intracanalicular biopsy of the mammary gland which is particularly useful in pathological processes with dilated galactophorous ducts near the nipple. If there is bleeding from the nipple a roentgen examination is first made to determine the site of the lesion. There is one possible source of error in this examination. Two ducts may empty through the same opening at the nipple and the normal rather than the diseased one may be injected with contrast material. When the process is located the mouth of the galactophorous duct is dilated with small metallic dilators of the type used in ophthalmology for dilating the lacrimal duct. Sometimes the dilatation is completed with a small laminaria tent sharpened at the end. This should be introduced gently only a little way to dilate the orifice of the duct. If introduced too far it may be hard to withdraw it. When sufficient dilatation has been brought about a small curette or loop is introduced and biopsy material obtained. Even if the biopsy shows only a benign papillary lesion it must be remembered that such growths may undergo malignant degeneration later. Such examinations make it possible for the surgeon to operate earlier in cancer of the breast or to perform small conservative operations in benign lesions.

The instruments used are illustrated and several cases are described and illustrated with photographs and photomicrographs of the operation specimens. An illustration is also presented which shows an incorrect technique in which a bubble of air is introduced with the injection of the opaque substance and may be mistaken for an intracanalicular vegetating lesion. AUDREY G. MORGAN, M.D.

Sacerdote de Lustig, E., and Schajowicz, F.: Cultivation of Tissue from a Giant-Cell Tumor of Bone (Cultivo de tejido de tumor gigantocelular de los huesos). *Rev. ortop. traumat.*, B-Air., 1944, 1: 134.

Previous investigation of the nature of giant-cell tumors of bone has not settled all the questions in regard to the giant cells which make up these tumors. The authors therefore made cultures of tissue from a giant-cell tumor of the femur in a woman of forty-nine. The tumor had originated in the bone cortex but had broken it down and invaded the surrounding soft tissues. Spontaneous fracture occurred which furthered the dissemination of the

tumor. Cultures were made of small bits of the tumor free of bone. The technique of cultivation is described. The history is illustrated with photographs and roentgenograms of the tumor and photomicrographs of the tumor tissue and giant cells.

The authors conclude that the giant cells of these giant-cell tumors of bone originate from young or immature mesenchymal cells of the fibroblastic type. They increase in size by repeated division of their nuclei without any corresponding division of the protoplasm, rather than by union or confluence of two or more mononuclear cells of the stroma. The authors cannot say whether this division of the nuclei takes place by mitosis or amitosis as they have not been able to observe uninterrupted development of a giant cell. However, from the absolute lack of mitosis in all the stages which they did observe they believe that the division is amitotic. Neither they nor any other observers have been able to see any typical or atypical mitoses in giant cells in ordinary histological sections. Giant cells were formed in considerable numbers in their cultures even though there was no bone or osteoid tissue in the fragments cultivated. The authors think that this fact argues against the theory that giant cells have an osteoclastic function, and that the tumor is not formed by "osteoclasts which, after having finished their work of destroying the trabeculae of the spongy bone and cortex, become confluent and increase in number," as Lubarsch claimed. AUDREY G. MORGAN, M.D.

EXPERIMENTAL SURGERY

Grossman, M. I., Dutton, D. F., and Ivy, A. C.: An Attempt to Confirm the Alleged Inhibitory Effect on Gastric Secretion of Jejunal Pedicled Grafts in the Wall of the Stomach. *Surgery*, 1945, 17: 685.

Repetition of the experiments of Andrus, Lord, and Stefko by the authors did not give the results reported by the former group. The authors found that implantation of a jejunal pedicled graft into the wall of the stomach, or perfusion of the stomach with jejunal washings, did not significantly alter the gastric acid secretory response to histamine stimulation in the dog. WALTER H. NADLER, M.D.

Wiener, A. S., and Sonn, E. B.: Heredity of the Rh Blood Types. Medicolegal Application in Cases of Disputed Parentage. *J. Lab. Clin. M.*, 1945, 30: 395.

The authors present data on the Rh types in a series of 91 families with 161 children. This presentation has been confined to the 6 standard genes and the 8 Rh types which they determine. No attempt has been made to discuss the Hr factor, or Race and Taylor's rare Rh_y and Rh_z genes, or the rare intermediate genes described by Wiener.

The application of the Rh types for the exclusion of paternity is based on the following laws of inheritance:

1. The factors Rh_o, Rh^1, and Rh^{11} are transmitted as simple mendelian dominants and therefore cannot appear in the blood of a child unless present in the blood of one or both parents. In applying this law it must be borne in mind that while there are 3 Rh factors, there are 5 agglutinogens, viz., Rh_o, Rh^1, Rh_1, Rh^{11}, and Rh_2, in which Rh_1 contains the factors Rh_o and Rh^1 together, and Rh_2 contains the factors Rh_o and Rh^{11} together. While agglutinogens Rh_1 and Rh_2 are usually transmitted as units by the corresponding genes Rh_1 and Rh_2, in occasional individuals (genotype Rh_o Rh^1 and Rh_o Rh^{11}) the factors will exist as distinct agglutinogens that segregate genetically. Therefore, while agglutinogens Rh_1 and Rh_2 usually behave as if they were simple mendelian dominants, there will be rare families in which the child will belong to type Rh_1 (or type Rh_2) and yet neither parent will have the agglutinogen Rh_1 (or Rh_2). For example, in the rare mating Rh_o x Rh^1, usually one-fourth of the children will give reactions corresponding to type Rh_1.

2. Parents belonging to type Rh_1Rh_2 or the rare type Rh^1Rh^{11} cannot have children belonging to type Rh_o or Rh negative. Similarly, parents of types Rh_o and Rh negative cannot have children of type Rh_1Rh_2 or Rh^1Rh^{11}. This law is obvious because parents of types Rh_1Rh_2 and Rh^1Rh^{11} must transmit one of the genes Rh_1, Rh_2, Rh^1, or Rh^{11} to each child, while parents of types Rh_o and Rh negative can transmit only either an Rh_o gene or an rh gene to each child.

3. Further exclusions of parentage are possible when more than one child is available for testing. For example, in the mating Rh_1 x Rh negative, if there is one Rh-negative child, then the Rh_1 parent must belong to genotype Rh_1rh, and children belonging to any type other than Rh_1 or Rh negative will be excluded. On the other hand, in the mating Rh_1 x Rh negative, if there are any children of types Rh_o or Rh^1, then there can be no Rh-negative children.

The Rh blood types are also useful for the individual identification of fresh, wet blood stains. The common blood groups and subgroups give rise to 6 types of blood; the agglutinogens M and N determine 3 types of blood; with anti-P serum, 2 types of blood can be distinguished, while with the 3 varieties of anti-Rh sera and with anti-Hr serum, 8 types of blood can be distinguished, so that in all, 6x3x2x8= 288 varieties of human blood which can be differentiated.

Rh genes are not sex-linked and most likely are carried in a different pair of chromosomes from the A-B-O and M-N genes. The discovery of the existence of 6 major allelic genes in the Rh series has materially increased the value of these tests for linkage studies in human genetics.

A third application is in relation to the problem of superfecundation. If an Rh-negative mother gave birth to triplets each belonging to a different Rh type, this could only be explained by assuming that at least 2 of the triplets had different fathers.

In this series of 91 families, a single apparent exception to the theory of 6 allelic genes was shown to be due to illegitimacy. These data combined with previously published results by the authors make a total of 197 families with 463 children which have been tested for the Rh blood types. The satisfactory agreement between the observations and expectations under the theory justify the medicolegal application of the Rh tests for the exclusion of paternity.

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Brunschwig, A., Bigelow, R., and Nichols, S.: Elective Occlusion and Excision of the Portal Vein. *Surgery*, 1945, 17: 781.

In the course of a laparotomy for excision of a carcinoma of the neck of the pancreas, the portal vein was accidentally opened and it was found that the tumor had infiltrated this vein. Copious hemorrhage resulted, and it was necessary to transect and ligate the portal and superior mesenteric veins. The patient died on the tenth postoperative day of bile peritonitis.

Autopsy revealed no evidence of any vascular disturbances due to portal-vein transection, and there were numerous venous anastomoses at the root of the mesentery between the mesenteric veins and radicals entering the inferior vena cava; there were also anastomoses between the portal and caval circulations in the spaces of Retzius.

This was not the first instance on record of occlusion of the portal vein which was gradual enough to permit the development of adequate collateral anastomoses. These facts raised the question in the authors' minds of devising a technique for gradual occlusion of the portal vein that would permit the development of collateral circulation in a relatively short time so that excision of the portal vein and terminal segments of the superior mesenteric vein might be carried out with survival.

In the laboratory, the authors found that omentopexy in dogs does not afford sufficient collateral venous anastomoses to permit survival after subsequent complete portal ligation. Their next step was to subject dogs to laparotomy. A linen thread was passed about the portal vein proximal to the entrance of the gastrosplenic vein and the long ends were brought out of the wound and tied over the back. On the fourth and subsequent postoperative days the thread was pulled upon for a brief period. On from the eighth to the twelfth postoperative day the intact loop was pulled out, which indicated that it had passed through the portal vein. About ten days were allowed to elapse for development of the collateral circulation and then a second laparotomy was performed for excision of a segment of the portal vein. Two of the 4 dogs were living and in normal condition four months, and seven and one-half months respectively, after operation; 1 dog lived three days, and then died of a generalized peritonitis, and 1 dog was sacrificed after a period of thirteen days, to confirm the absence of continuity of the portal vein.

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HOSPITALS; MEDICAL EDUCATION AND HISTORY

Wells, D. B.: The Circus Disaster and the Hartford Hospital. *N. England J. M.*, 1945, 232: 613.

This article reports on the part played by the Hartford Hospital in the care of victims of the circus disaster of July 6, 1944. The importance and effectiveness of preparedness on the part of the hospital for this type of emergency was thoroughly demonstrated. In less than fifteen minutes 125 human beings, more than half of them children under fourteen, were burned to death on the lot. The various hospitals of Hartford admitted 183 others, of whom 150 were burned, 43 of these subsequently died. In all, 86 living patients were brought to the Hartford Hospital, and 51 burned patients arrived within thirty minutes. Only 19 could be treated as ambulatory cases.

Disaster preparedness consists first of provision of adequate shelter for the victims and facilities for efficient emergency treatment. Morphine and blood plasma in adequate quantities are essential therapeutic requirements. A sufficient number of trained personnel must be available on short notice, and an organized professional staff is necessary. The author describes how each of these prerequisites was fulfilled at the Hartford Hospital.

The first floor, designed to be used ultimately as an outpatient department, is constantly maintained as a properly located, adequately protected, completely equipped Triage Room, where a considerable number of casualties of any type can be assembled and definitive treatment instituted in the event of civilian disaster. Here 20 beds are kept constantly made up. At either end are lockers containing all necessary emergency apparatus. The room is equipped with utility hoppers; oxygen is piped directly into it; there is central suction; heavy-duty rubber-covered electric cables with numerous multiple plug receptacles are on the floor. Down the corridor are two air-conditioned emergency operating rooms with complete pressure-sterilizing equipment, ordinarily used as cystoscopic rooms. Here, and in the regular accident rooms the casualties were admitted and received their initial morphine and plasma, laboratory determinations were made, and wounds were dressed; ultimately, the patients were transferred to the wards as these were set up to receive them.

At an earlier date the citizens of Hartford had made contributions to pay for a cache of 2,700 pints of frozen plasma, which was in storage at strategic points against sudden, unexpected demands of civilian disaster. On the day of the circus fire about 28 gallons of plasma were given intravenously. A large part of the plasma, blood, and electrolytes given to the burned patients was introduced directly into their femoral veins. Red Cross nurses' aides, previously trained, and an organized group of volunteer business and professional men, known as "medical aides," met the shortage of trained professional personnel.

The hospital had a Burn Committee consisting of three surgeons, four physicians, a pediatrician, two pathologists, and adjunct members in various specialties. This committee had a typed-out plan for the definitive treatment of such burns as might be assigned to it, and as a result every burn was uniformly treated. This plan closely follows the so-called "unorthodox method" employed at the Massachusetts General Hospital, Boston, at the time of the Cocoanut Grove Disaster: immediate intravenous morphine; intranasal oxygen, if necessary; clinical evaluation of impending shock and absolute priority treatment of existing shock with plasma in adequate quantity, as determined by frequently repeated laboratory checks; no cleansing or débridement of the local injury; simple protective pressure dressings, with previously prepared sterilized vaseline strips overlaid with dry gauze smoothly applied, sheet wadding rather than mechanics' waste, and Ace bandages. Folded newspaper splints were applied to extremities, with a second Ace bandage fastened to the newspaper splints. Every patient was supposed to receive intravenous sodium sulfadiazine. Sulfonamides were discontinued after thirty hours when the National Research Council made an outright gift of 220,000,000 units of penicillin for both therapeutic and prophylactic use.

It is emphasized that during the first forty-eight hours burns are a problem in physiological chemistry and psychiatry. The only necessary surgical procedure in severe diffuse burns is to protect the wounds from infection and further trauma. The recognition and adequate treatment of shock is the important therapeutic problem, and in terrible mass catastrophes emotional shock is superimposed on traumatic shock. With this in mind careful social service investigation was instituted in every case and psychiatric evaluation and treatment were undertaken in a number of cases. The local wounds were treated by application of a bland ointment, a massive immobilizing dressing, and delayed skin grafting of third-degree areas. Not a single burned patient died at the Hartford Hospital of burn shock and only 3 of the burned patients died. JOHN L. LINDQUIST, M.D.